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# The Mining Journal

LONDON, MAY 27, 1960

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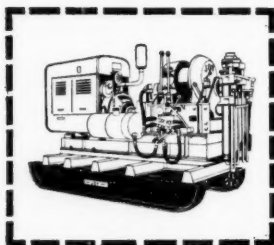
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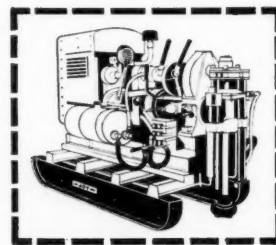


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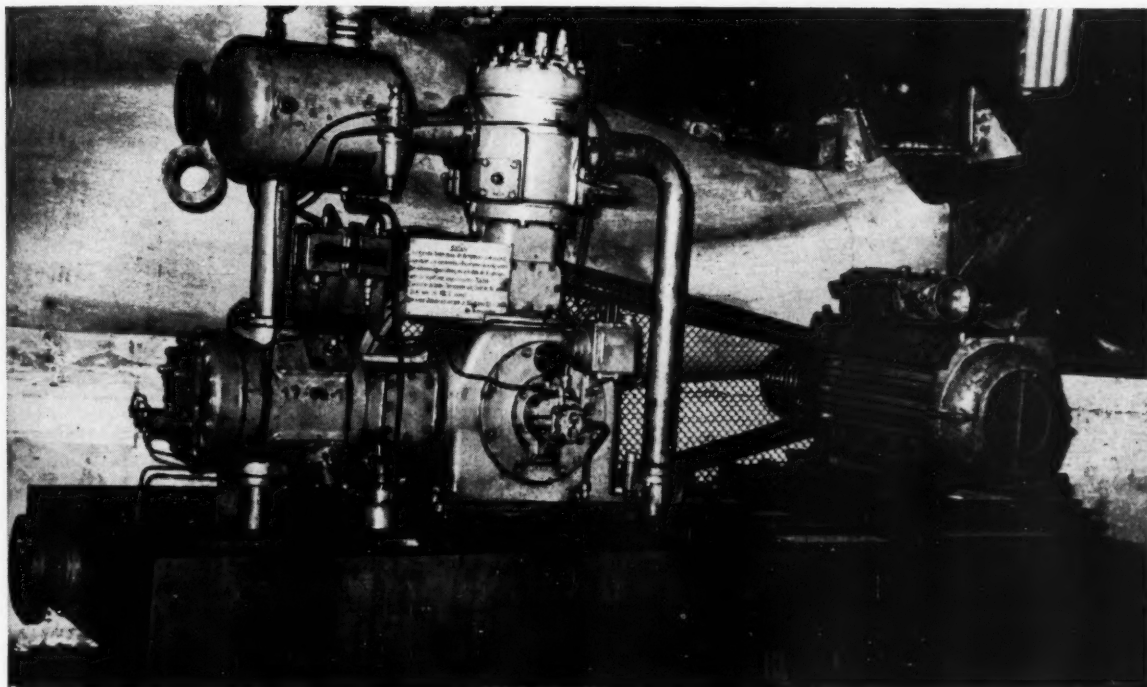
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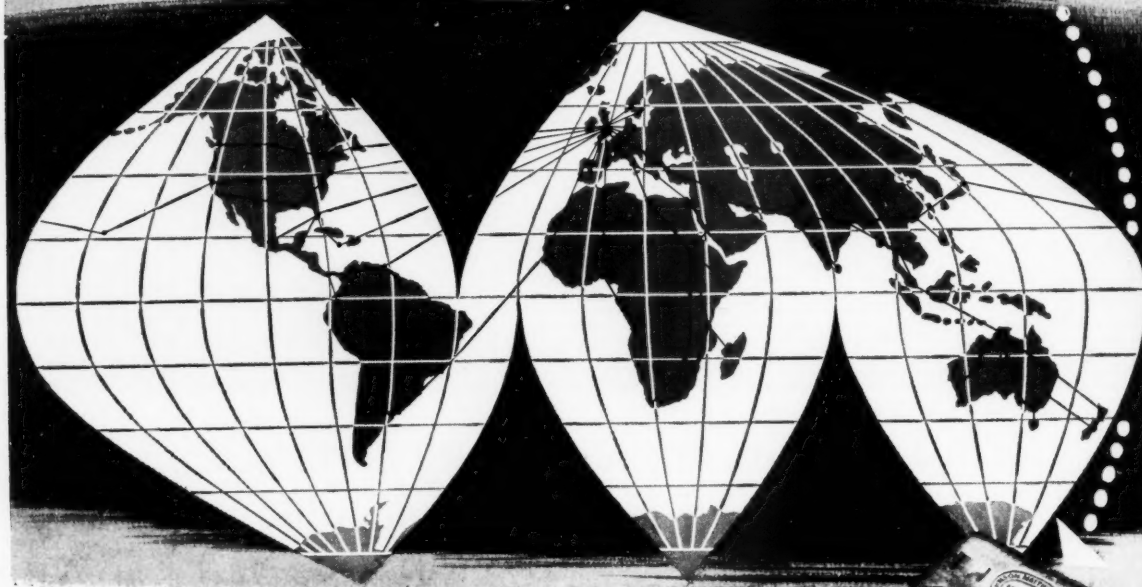
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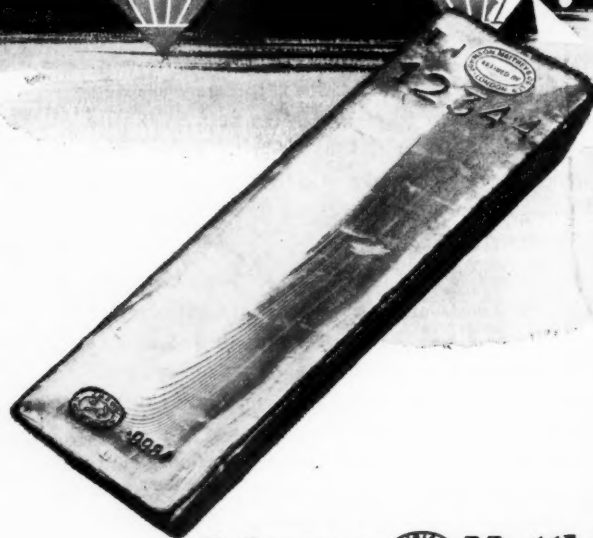
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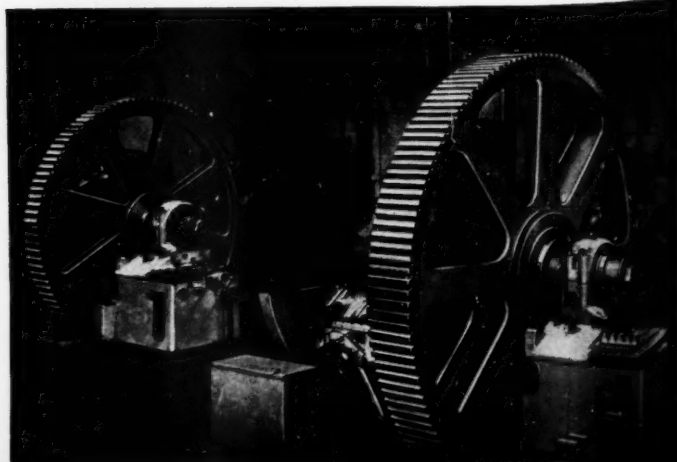
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# The Mining Journal

London, May 27, 1960

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## The Training of Mining Geologists

**I**N most countries outside the U.S.S.R. there is a dearth of geologists, geophysicists and geochemists actively engaged in searching for minerals, especially of men versed in the theory and practice of mineral exploration. Lack of official appreciation of geology is glaringly exemplified by the fact that even as late as 1938-39 there were only about 50 geologists engaged on all the Colonial Geological Surveys spread out over an aggregate area of millions of square miles. Although these Surveys have accomplished admirable work in difficult circumstances, their achievements would obviously have been much greater and their mineral discoveries more numerous had they been adequately staffed and included more specialists in mineral exploration.

Russia, on the other hand, has a Ministry of Geology and scores of thousands of geologists, including a vast host to sustain its ever-expanding mineral industry.

This contrast was drawn by Professor David Williams in his presidential address to the Institution of Mining and Metallurgy on Thursday, May 19. Are we in the British Commonwealth right in not making more practical use of geology, he asked, and the Russians wrong? The answer to this question is to be found, of course, in the spectacular success of mineral exploration in the U.S.S.R. since the revolution.

Professor Williams argued that, in general, there was a deplorable lack of appreciation of the practical value of geology, not only among the public but also among sections of the mining industry, civil engineering and allied enterprises. This unhappy state of affairs he attributed in considerable measure to geologists themselves, not least to those in Britain, so many of whom are still loath to venture from their ivory towers into the realm of economic geology. Compared with other sciences, he stated, geology had done little to advertise its cultural and practical usefulness, or to emphasise its intimate concern with the ultimate source of man's wealth and industrial prosperity.

Mining geology, as Professor Williams sees it, is both a science and a technology, since in certain aspects it is concerned with fundamental research into the nature, origin and location of mineral deposits, while in its utilitarian role it is essentially directed towards the discovery of ore and its subsequent exploitation. By some of its practitioners it is much too narrowly regarded as an engineering enterprise, whereas in reality it also offers ample scope for field and laboratory research no less profound than in so-called "pure" geology. Indeed, if the task of mineral exploration is to be pursued scientifically, as it must be, it is imperative that more attention should be focused on basic research, on factors governing the distribution of different elements within the earth's crust, and on the complex mechanisms of ore formation.

"Fortunately the 'wind of change' is beginning to blow through the cloisters," declares the Professor, "and though still no

more than a zephyr, it is slowly dispelling the old, derogatory and naive allusions to 'pure and impure' geology, so that students now see more clearly than hitherto that geology is really indivisible, its scope embracing not only theoretical abstractions but also practical objectives."

To what extent are the existing training facilities at our schools of geology capable of providing an adequate supply of well-qualified men to meet our future needs? The training of geologists was discussed in our issue of April 17, 1959, pp. 411 and 412, when the opinion was expressed that, with certain notable exceptions, there appeared to be many schools of geology in the United Kingdom where the economic aspect was neglected.

This view is evidently shared by Professor Williams, who considers that the present training of "pure" geologists wishing to enter the mining industry leaves much to be desired. With few exceptions, he points out, the normal degree course in geology in Britain seldom contains more than a smattering of mining geology, ore microscopy or applied geophysics, scarcely any applied geochemistry, and never any instruction in mining subjects or experience of underground mining practice.

Prof. Williams regards it as desirable, though not essential, that the initial training of the mining geologist should be carried out in an institution where geology, mining, mineral dressing and metallurgy departments work in close harmony, so that the student at an early age imbibes the general atmosphere of his profession. Those wishing to enter the industry after graduating outside such an environment would do well to take a specialist postgraduate course within such surroundings.

Specialized training in mining geology, leading to an Honours degree in the subject, is available in Britain only at the Imperial College. The Professor gave a brief summary of the three-year undergraduate course carried out there under his aegis. Field trips and practical work on surface and underground are essential aspects of the first year course. In the second year emphasis is placed on surface and underground geological mapping. After the close of the session each student spends three months on field work, usually abroad, as a member of a prospecting team or an underground geological worker at a mine, where material is collected for the preparation of a thesis in the final year. There can be little doubt that this degree course, in which every effort has obviously been made to provide the optimum blend of theoretical instruction and practical training, provides an admirable scientific foundation for a career in mining geology.

So far as the "pure geologist" is concerned, Prof. Williams does not subscribe to the opinion, expressed in some quarters, that it is best for him to "learn the tricks of the trade" by joining the industry immediately after first graduation. He considers it highly desirable that on completion of the normal three-year degree course the student wishing to embark as a geologist in the mining industry should take a postgraduate course in mineral exploration immediately after graduation or after gaining some experience in industry, government service, or elsewhere.

Stress is laid, in the address, on the growing tendency nowadays for industries to demand men more highly trained than the average graduate. Unless British geologists entering the mining industry receive the best possible scientific and technical training, there is a grave danger that in future, due to foreign competition and the rapid spread of nationalism, they may be ousted from spheres formerly regarded as their monopoly. It is emphasised that nothing less than our future standing in economic geology in relation to other nations is at stake, and failure of our geologists to achieve a high standard of efficiency may have serious and far-reaching consequences.

Prof. Williams is strongly of the opinion that it is in the best interests of the mining industry to support postgraduate courses in mineral exploration. Present applications to

attend the course at Imperial College far exceed the permissible intake, due largely to dearth of accommodation. The hope is expressed that other mining companies will soon follow the recent lead of Rio Tinto by offering postgraduate bursaries in mineral exploration, not only to new graduates but also to men with experience in industry. It is further suggested that the mining industry might also help itself by tendering advice and guidance in the conduct of these courses at appropriate centres, by contributing funds towards their proper establishment and operation, and by providing means for those in charge of undergraduate and postgraduate training to replenish their knowledge by visiting overseas mining fields and research organisations.

After stressing the importance of research and discussing the scope for the employment of geologists in the mining industry, Prof. Williams concluded this challenging address with the encouraging news that an increasing number of young men in Britain are anxious to embark on a geological career, as testified by the fact that approximately 240 hope to graduate with an Honours degree in geology two months hence and that an equal number are now engaged on postgraduate research in the subject, of whom roughly 100 will probably gain an M.Sc. or Ph.D. degree in 1960. Unless the upward trend is reversed, there should be no dearth of recruits. The warning was given, however, that unless various industries awoke more fully to the realisation of what geology could offer them, many young men might shrink from entering the profession.

#### THE CHANGING PATTERN OF SOUTHERN RHODESIA'S MINING INDUSTRY

The mining industry in Southern Rhodesia was opened up by the prospector small-worker. Now, with the development of new techniques, the industry is in the process of being taken over by larger mining companies who have not only the necessary finances but also the know-how of modern prospecting and mining practices. This does not ring the death knell for the individual prospector and small-worker, who can still make a valuable contribution to mining, but there can be no doubt that the pattern of the industry is changing.

In his presidential address to the Chamber of Mines of Rhodesia on April 26, Mr. T. A. J. Braithwaite, stressed the need for this changing pattern to be accompanied by some change in the Government's approach to the industry, as well as in the industry's own approach to its problems. For the encouragement and development of the mining industry for the future, when concerns will be operated more and more on a larger scale, Mr. Braithwaite regards longer-term planning as essential, particularly in the exploration field, in order to ensure adequate ore resources for future operations. The country's mining legislation, in the past, was essentially so designed as to cater for prospecting by individuals and for relatively small-scale mining operations, but in recent years measures have been introduced to encourage prospecting activities by the larger mining companies.

For some time, the Mining Law has been under review and negotiations are currently in hand between government and the agricultural and mining industries with a view to reframing the legislation. This revision of the Mining Law is described as being an important first step towards the creation of the new conditions necessary to meet the changing conditions in the mining industry on the one hand and the rights of the more intensive farming industry on the other hand.

The exploitation of a mineral deposit must always be accompanied by a large element of uncertainty and risk and is more and more going to require the investment of large capital sums. The greatest degree of stability is necessary if Southern Rhodesia is to attract the capital required for the development of its mineral reserves. The Chamber has been

disturbed in recent years at the marked and detrimental imposition of taxes and tariffs on the mining industry. In this connection Mr. Braithwaite referred specifically to the Royalty Tax on base minerals. Southern Rhodesia, he contended, must be one of the only developing countries in the world which levies differential taxation on one of its main primary industries. A plea was made for some structural overhaul of the existing fiscal arrangements.

Other governmental decisions which have had a material bearing on working costs within the last two years are increases in rail tariffs, the recurring increases in electricity charges, and the withdrawal of part of the maize subsidy which was transferred to consumers.

During 1959 the Minister of Transport considered it necessary to impose a 10 per cent surcharge on rail tariffs for all goods carried. It now appears that the estimates on which this decision was based were inaccurate and that the anticipated deficit was not nearly as great as had been expected. Nevertheless there is no indication of the surcharge being withdrawn until July 1, 1960.

The position regarding electricity charges is regarded as very unsatisfactory. The Chamber has for many years urged that a Royal Commission be appointed to examine and report on the whole structure of the electricity industry.

In the past, it has been necessary for the few larger mines in the country to assume certain responsibilities which, outside the mining industry, are undertaken by government—for example, the provision of Health and Hospitalization and Medical services, and of facilities necessary for the education of African children. Mr. Braithwaite suggested that, in view of the advent of more and more larger mining concerns and the greater stability which must accordingly exist, the Government should reconsider the whole matter of its responsibilities, *vis-à-vis* these undertakings and should progressively provide for the European and African communities at these larger mining centres in the same way as is done in urban and peri-urban areas.

The suggestion was also made that the Minister of Mines should appoint a high level committee to review the facilities presently available for technical research, and to make recommendations on the future policy to be adopted in this important sphere. Closely associated with this subject is the provision of adequate basic and technical training facilities for the industry. In this connection the President reported that negotiations were well advanced with the Ministers of Mines and Education, which would lead to the establishment of a mining section at the Bulawayo Technical College in 1961.

## MOROCCO PLANS NEW STEELWORKS

The Moroccan Government has just completed plans for the construction of a steel plant at Las Cadenas, a virtually undeveloped spot on the Mediterranean coast near the Moulouya River estuary in north-east Morocco and about 50 miles from the Spanish iron mines operated by the Minas del Rif S.A. near Nador. A government spokesman has said that the new plant would have a capacity of 250,000 tons of steel and 20,000 tons of ferro-manganese a year. Total cost was estimated at 30,000,000,000 francs but only a first phase costing 16,000,000,000 would be built for the time being.

The first phase includes the construction of a new harbour at Las Cadenas and a railway linking it directly to the iron ore deposits. At present a railway links the workings to the Spanish seaport of Melilla through which all the ore mined (over 1,000,000 tons a year) has hitherto been exported to Spain for reshipment to various European countries, notably Britain and Germany. The plan is to use classic and proved processes and hence the manufacture of coke from anthracite produced by the Djerada mines near Oujda, is a part of the overall scheme.

Raw material for the manufacture of ferro-manganese will probably be supplied by the nearest large manganese workings operated by the S.A. des Mines de Bou Arfa, whose mines are approximately 200 miles south-east of Las Cadenas.

Whilst the project has been adopted by the government, no decision has been taken regarding the problem of financing it, according to officials of the state-controlled Bureau d'Etudes et de Participations Industrielles (B.E.P.I.), which has drawn up the plans. B.E.P.I. officials declare that various sources of capital are being explored.

Last month Morocco was granted a loan of \$23,000,000 by the U.S. D.L.F. to finance a large storage dam and irrigation network in the same area, i.e. in the plains adjacent to the Moulouya River estuary. This project includes provision for the construction of a hydro-electric power plant at the foot of the Mechra el Klila dam. While the dam is to be built with the D.L.F. loan, the power plant will not be built until a much later date unless the demand for power warrants it.

According to the B.E.P.I., construction of the new steel plant should begin soon and take four years to complete.

## FINANCIAL PROBLEMS OF CONGO INDEPENDENCE

The second round-table conference held at Brussels to consider economic and financial aspects of the handover of sovereignty to the Belgian Congo ended on May 16. Like the previous conference, devoted to politics, its conclusion was followed by the proclamation of 18 resolutions. Our correspondent in Brussels points out that these resolutions are only suggestions and recommendations for transmission to the political authorities. Their acceptance or rejection must obviously be largely dependent on the results of the elections which are not yet known. That the elections appear to have taken place in most parts of the country in a reasonably calm atmosphere is regarded as an encouraging augury.

The Congo delegates, while recognizing the serious budgetary and financial condition of the territory, and though willing to accept Belgian financial and technical aid, do not necessarily accept the conditions under which the aid was offered. They indicated that Belgium would be the first, but certainly not the only, country asked for aid, and that she would not start on a more favoured basis than other countries. Belgium would, however, appear as the Congo's sponsor for the I.M.F., the World Bank and other organisations. The delegates were apparently surprised to find that the economics of a country presented such complex and difficult problems.

Among the recommendations were several of direct interest to the mining companies. Resolution 8 is intended to guarantee the freedom of participation to all investors—Congolese, Belgian and others—as well as an equitable return.

In terms of Resolution 16 the chartered and concessionary companies, such as Comité Spécial du Katanga and Comité National du Kivu, will be kept in being, but their authority will be limited and some aspects of administration will be subject to the jurisdiction of the Congo Government.

Resolution 18 was concerned with the ownership of land and mines, but the final decision on this question rests with the Congo Government. It seems probable that many non-exploited concessions held by the companies are to revert to the Congo Government authority, on the ground that the companies in question have incurred no expenditure on exploiting these areas. This is a very important issue for the companies who have prospected for bauxite and petroleum. If they can put up a sound economic case for failing to exploit the areas in question, they may be allowed to keep their concessions, the sole purpose of the resolution being to reduce the areas conceded for speculative purposes.

Our correspondent emphasises Belgium's determination to hand over to the Congo Government a country which is financially and economically in a sound condition.



# Technical Developments in the U.S. Coal Industry

**C**ONTINUOUS mining leads all other methods of underground coal mining in productivity per man-day, declared R. L. Anderson, a commodity industry analyst of the U.S. Bureau of Mines. In a report on productivity of continuous and conventional mining equipment, Anderson stated that U.S. production from continuous mining rose from 8,000,000 tons of bituminous coal in 1952 to an estimated 70,000,000 tons in 1959, or about one-fourth of total underground production.

Successful adaptation of continuous mining machinery is resulting in rewarding production of coal from low seams according to K. S. Hobbs, superintendent of Eastern Gas & Fuel Associates of Helen, W. Va. He said that the installation of a continuous miner and chain conveyor system at his company's Stotesbury No. 10 mine had resulted in an average production of 472 tons per 5½-man crew shift, or 85 tons per producer. The average height of the seam being mined is 34 inches. Elimination of the time now expended adapting the conveyor's location to the continuous miner would permit a 100 per cent continuous mining system with "staggering" tonnage production potentials. Such a system, it was stated, is now available and is being considered for use in the development of butts and main entries. Installation of the continuous miner has not caused any major problems in the preparation of coal. It has, however, resulted in a change in size distribution, which requires some adaptations of cleaning facilities.

In addition to increasing tonnage output per man, the installation of continuous mining equipment is expected to pay "big dividends" in coal-mine safety, stated Harry LaViers, Jr., vice-president of South-East Coal Co., Inc., of Irvine, Ky. LaViers said that the mechanization of his company's three deep mines in Letcher County, Ky., had resulted in an increase in production from 30 tons per man per day to 50 tons. Continuous mining machinery resulted in a reduction of crews from 11 men to six men per shift, expected to make a significant contribution to safety records.

## Ventilation

Adequate ventilation and dust control at the working faces of coal mines using continuous miners presents a knotty problem because these machines rip or bore entries with a cross section barely larger than that of the machines. C. H. Patterson, safety director of Rochester & Pittsburgh Coal Co., gave a detailed account of his company's experiments with auxiliary fans located near the working places, underground use of which requires a special permit from the Joint Industry Safety Committee. Two different methods of ventilating the face region with the fans—exhaust and forcing—are being tried, and both methods have their advantages and disadvantages. When the air is directed to the working face by the blowing method, it must return over the equipment and workmen even though it carries much coal dust—obviously not good from a health, safety or productive standpoint.

Patterson pointed out that with the exhaust system, return air is picked up, together with the dust created by the mining, by a vent tube and discharged into the return airways aft of the machine, thus keeping the mining area much freer of dust

The 1960 Coal Convention of the American Mining Congress opened at Pittsburgh on May 9. In a three-day programme 94 speakers discussed various economic and technical developments affecting the coal industry. By courtesy of the American Mining Congress, some of the developments described at the Congress are briefly summarised

particles. A disadvantage of this method is depositing of dust in the return airways, he added. Experiments to date make it evident, he stated, that the immediate face area cannot be ventilated properly with an auxiliary fan and tubing alone; booster fans are needed to supplement the auxiliary fan.

W. F. Diamond, manager of engineering, Island Creek Coal Co., pointed out that despite the growing use of continuous mining machines, conventional mining equipment was definitely not on the way out. In a paper on "Factors Affecting the Choice Between Continuous Miners and Conventional Equipment," Diamond said that while continuous miners had been gradually improved over the past decade, manufacturers had also been improving the performance and increasing the productive capacity of conventional machines. As a consequence, he stated, "any decision involving the selection of production units for a new mine, or for the machines to re-equip an old mine, must include a study of the possibilities of using both types of equipment."

A new technique adaptable in the strip-mining of coal—moving the rock overburden covering the coal seams by use of explosives—was described by August Manifest, an official of Marco Coal Co., Apollo, Pa., who said that the technique, worked out last year with representatives of a powder company, required only a few more drill holes than the earlier method, which resulted only in the breaking-up of the overburden and used almost the same amount of ammonium nitrate. The effect was that one-third or more of the overburden was shot across the pit to the spoil pile and needed no further handling. The new method was credited with extending the operating life of expensive draglines and other equipment, cutting maintenance costs, and reducing 'dozer time in reclaiming the mined-out areas. Other possible benefits of the method are reduced cost for backfill due to the even spread-out of overburden, easier handling of spoil on inside curves, and a reduction in the amount of dragline hoist.

Hydraulic mining of bituminous coal, using water pressure of 4,000 p.s.i., has been proved feasible in experiments conducted by the U.S. Bureau of Mines, reported J. J. Wallace, Bureau research engineer. The experiments, conducted in the hard bituminous Pittsburgh coal bed in a mine in Indiana County, Pa., involved installation of a high-pressure pump actuated by a 900-horsepower diesel engine and extremely heavy carbon-steel pipe which will withstand a pressure of 8,000 p.s.i. Nozzles used in the various tests had openings ranging from ⅛" to ½", the best results being obtained with a ⅜" opening. Laboratory testing will be done at the mine to determine the best nozzle design for the most effective cutting rate.



Radioactive isotopes' gamma rays are being used to improve the quality of anthracite coal. J. E. Ippoliti, chief engineer of the Wilmot Engineering Co., described how gamma rays are utilized to keep constant the specific gravity of flotation media used in coal preparation processes to separate coal from rock particles and other refuse. The rays measure the density of the media and trigger adjustments when the specific gravity varies from a pre-set figure. Application of this system, it was reported, offers almost unlimited opportunities for increasing management's control over production standards.

### Electronic Computers

Use of electronic computers has made possible a statistical quality control technique aimed at obtaining optimum coal quality and consistency of product, according to an official of U.S. Steel Corp. R. D. C. Morris, assistant to the Corporation's vice-president operations (coal), said the function of the new technique was to indicate when significant quality changes have occurred in washed coal products as measured from accepted quality standards. A computer supplies the required information with great rapidity, enabling the making of timely decisions in regard to the operation of coal washers, the blending of coals, and the burdening of blast furnaces. Through analysis of washed coal quality requirements it has been determined that quality data should be made available reflecting daily, weekly, and monthly performances against accepted standards for moisture, ash, and sulphur. Various statistical tests are performed on the quality data, and results of these tests indicate whether or not the analyses are consistent for practical purposes, or whether significant departures are being experienced for which positive corrective action must be taken.

W. L. Zeller, assistant district industrial engineer, Frick District, U.S. Steel Corp., said his company's coal division had found that use of a computer made possible swift evaluation of new equipment, changes in mining plans or working methods, determination of the effect of changing natural conditions, and the establishment of the accurate production standards essential for an effective cost-control system. Zeller described a computer programme involving simulation of continuous mining with a milling-type miner. The first pass through the machine calculates the workloads and running time of the continuous miner and shuttle cars under all conceivable conditions based on input data regarding standard times and the mining plan. The output, or answers, from this pass can then be used in the second computer pass to determine shift production under any combination of conditions. It was noted, however, that computers are useless without being provided with intelligence by engineers and technicians, making it "more evident than ever that our technical organizations must be staffed with engineers who can learn the know-how and the know-why of this 20th-century tool."

### Maintenance

Recognition of the fact that "machines are bought to produce, not to be maintained" should stimulate the progressive coal mine operator to think in terms of preventive maintenance as well as repair work, declared Roy M. Leseney, mechanical superintendent of the Truax-Traer Co., who described maintenance operations in his company's strip-mining operations. Preventive maintenance for haulage equipment starts with "well-built, well-maintained, and regularly sprinkled haul roads," he stated. "Haulage equipment lasts longer without expensive repairs if it travels over smooth, dust-free roads. Air cleaners are more efficient with less servicing. This means less dirt enters the engine to cause

rapid valve and ring wear. Good roads cut tyre repairs." Leseney emphasised that routine servicing should never be neglected and that employees should be trained to be maintenance minded. "By keeping his eyes open, one of our oilers saved us enough to pay his wages for several years. While working on one of the shovels he noticed a crack in one of the rods supporting the boom. He immediately had the machine shut down so the rod could be welded. If the repair had not been made, a broken rod could have led to a collapsed boom and serious damage to the rig."

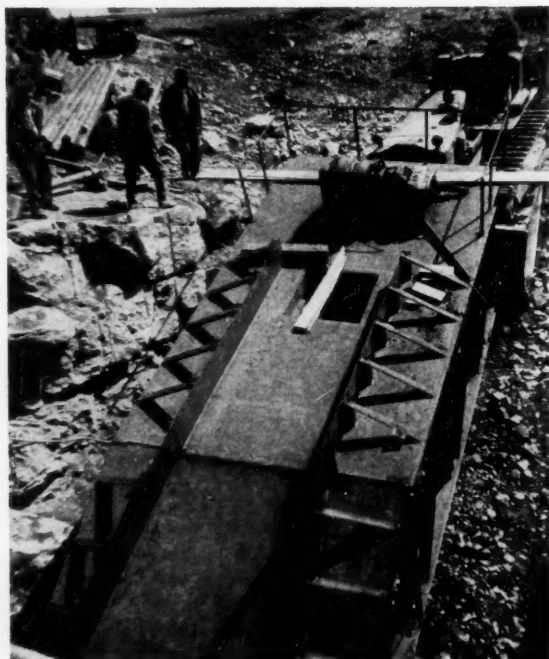
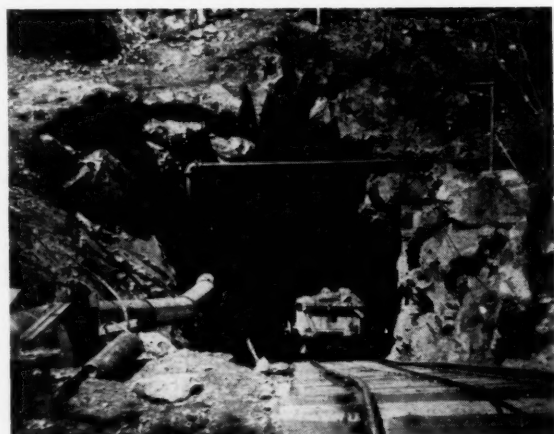
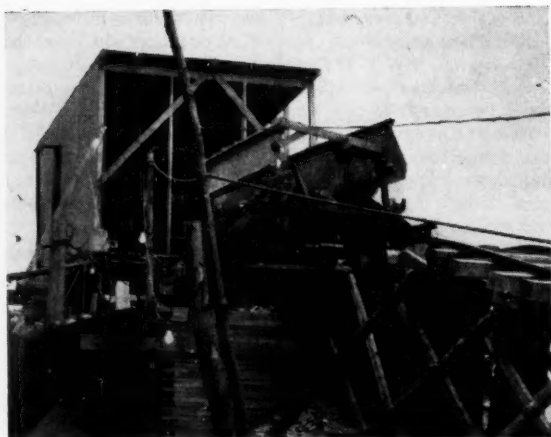
Useful life of wire rope, an indispensable tool of modern mining, can be extended for years by proper maintenance procedures, said A. F. Meger, assistant chief engineer of a wire rope division of Colorado Fuel & Iron Corp.

He listed several maintenance steps which would cut rope costs appreciably while reducing down-time of hoists, shovels, draglines, and other equipment and improving safety of employees. One of the best methods of lengthening the life of wire rope is adequate lubrication during both storage and use, Meger said. Rope in storage should be shielded from direct exposure to the elements, for a severe spot of corrosion acts similarly to a nick or sharp cut, establishing a stress concentration point which will deteriorate rapidly once the wires start flexing over sheaves. A successful method of lubrication when ropes are in use incorporates automatic or semi-automatic mist application of small amounts of a light lubricating oil. The resulting oil film minimizes internal friction in the rope and at the same time cushions the wear between operating sheaves and the rope itself.

An intensive and complete maintenance programme for underground conveyor-belt haulage systems was credited with cutting time loss due to mechanical failures to only 10 minutes per six and one-half hour shift. The maintenance programme was described by Buddie R. Morris, head industrial engineer of West Kentucky Coal Co., Inc. Morris explained that maintenance begins with the design of the haulage system, which should have a built-in safety factor to permit it to haul up to 40 per cent in excess of average hourly tonnage. Also, shafts, gears and pulleys should be interchangeable to the greatest degree possible. Good housekeeping is important to conveyor belt maintenance. Approximately 10 cents per ton of coal produced is spent by his company on wages for belt cleaners and header men, he said. "Preventive maintenance is especially important for belt haulage systems," Morris said. "If your haulage system ceases to function, it may, as in our case, cost as much as \$3,900 per hour."

### Haulage

Underground coal mines of large productive capacity continue to rely heavily on track haulage systems despite the rapid increase in use of belt conveyors, it was stated by J. S. Schrencengost, chief engineer of the Allegheny River Mining Co. Most operators, according to Schrencengost, use a track system for main line haulage and conveyor belts from the working faces to mine cars. A track haulage system properly installed with the best available materials today is the most nearly continuous, interruption-free and safest type of haulage. Among the advantages of a track system, asserted this speaker, are safety of personnel transportation, quick availability of repair parts or supplies, ease of handling large pieces of coal or rock without damage to haulage equipment, ease of loading and moving rock or equipment out of the mine without interference with production or preparation of coal. Schrencengost said track installation and maintenance could be greatly speeded in most cases by use of a mechanical track tamper, and that tracks could be rapidly cleaned at the lowest possible maintenance cost by use of a mechanical track cleaner which automatically picks up coal and other refuse and conveys it to a trailing mine car.



## UNDERGROUND DEVELOPMENT A

**H**ULL Iron Mines Ltd., an iron mining company in southwestern Quebec, has discovered that it can turn a long-unworked open pit into a profitable operation by resorting to underground mining and carrying out extensive development work.

When diamond drill cores indicated the presence of an ore deposit approximately 600 ft. long, between 15 and 100 ft. wide and more than 400 ft. deep, containing at least 55 per cent iron, the company decided to drive an 800 ft. long incline at a 15 deg. slope into the country rock beside the orebody. This incline, providing access to the orebody below the bottom of the abandoned workings and allowing their drainage and clearing, also was to permit recovery of ore for mill tests. Preliminary plans called for a crushing plant at the 200 ft. level with crushed ore moving to the surface by a conveyor in the 800 ft. incline. Further development of the lower regions of the orebody was proposed by driving an additional incline from the 200 ft. level.

On this basis, Dravo of Canada Ltd., Toronto, was awarded a contract in May, 1958, to sink the 800 ft. incline. This incline has since been completed to a length of 1,000 ft. and development work has been carried out on the 200 ft. level. Draining and clearing of the old workings have also been accomplished.

Four hundred tons of ore were removed from the 200 ft. level and delivered to a steel mill for testing. These tests indicated that the raw ore could be smelted to produce pig iron containing 3.5 per cent carbon, 1.5 per cent silicon, .05 to .07 per cent sulphur, .04 per cent phosphorus, 0.3 to 0.4 per cent manganese, .05 per cent nickel and traces of copper and titanium. It was also shown possible to use the raw ore to produce a semi-steel containing 1.0 to 1.5 per cent carbon, .07 per cent silicon, .15 to .25 per cent sulphur, .02 per cent phosphorus, .08 per cent manganese and .03 per cent nickel.

Further diamond drilling and preliminary metallurgical analysis indicated that the ore from the 400 ft. level would be more saleable than that from the 200 ft. level. On the basis that the 400 ft. level ore would be mined first and with the promise of ore below the 500 ft. level, a change in method of development was decided on by Hull Iron Mines.

As a result, Dravo was awarded a further contract to sink a three-compartment shaft from the 100 ft. level to the 480 ft. level. Ore pockets were to be installed between the 100 ft. level and the surface (at plus 65) and a crushing plant was proposed for the 100 ft. level to crush and blend ore from the 400 ft. and 200 ft. levels before sending it to the surface by conveyor for delivery to the steel mills.

In addition to sinking the shaft, Dravo was to drive a cross-cut to the ore at the 400 ft. level to allow further diamond

The Ironside operation. Top, mine car dumping material from the shaft. Centre, view towards the tunnel face. Bottom, 12 ton slusher ramp used in shaft mucking

## ABANDONED OPEN PIT

drilling from that point to outline the orebody above and below the 400 ft. level.

Dravo sank the first incline, which was 18 ft. wide by 12 ft. high, using the standard sequence of drilling, blasting and mucking, with the muck being loaded directly into trucks at the mine portal by a 25 h.p. slusher. After the passage was driven about 150 ft. the slusher remained at the tunnel face and loaded into rubber-tyred mine cars pulled by a D-8 Caterpillar tractor.

This latter process was facilitated by the installation of a 12-ton, 40 ft. long steel slusher ramp just behind the tunnel face. Built in two pieces at Dravo's Deseronto, Ontario, yard, the ramp was bolted together at the site and skidded down the incline by tractor. The slusher pulled the muck up this ramp and dumped it into the cars through an opening in the ramp. The cars, which weigh about three tons empty and ten tons full, were then pulled to surface and side dumped into a steel-lined timber muck bin, from which the trucks were loaded.

When the work had progressed to a point about 300 ft. from the portal, ventilation problems in connection with the use of the tractor made it necessary to use an air hoist on the surface to pull out the mine cars. The hoist, a single-drum Lambert with an 8,000 lb. rope pull, was set up on an embankment directly in front of the portal, 30 lb. rails were laid to the slusher ramp, and the mine cars' rubber tyres were replaced with flanged wheels.

To remove smoke from the tunnel, Dravo first used a 5 h.p. fan. However, as the shaft was lengthened, a 15 h.p. fan was substituted to meet the increased ventilation requirements.

The new shaft was to be constructed by first driving a vertical raise from the 100 ft. level through to the surface (a distance of some 165 ft.) and then sinking the shaft from the 100 ft. level to the 480 ft. level by standard shaft sinking operations.

The shaft was to consist of two 6 ft. by 6 ft. skip compartments and a 5 ft. by 6 ft. manway. Shaft sets of 8 in. by 8 in. local timber were to be installed at 7 ft. intervals and the standard items of ladders, landings, vent pipe, air line, water lines and electrical cables were to be installed in the manway compartment.

It was intended to install a 60 in. by 60 in. Canadian Ingersoll Rand double-drum electric hoist at the surface to carry out the shaft sinking and future development work. Because the shaft was being sunk from the 100 ft. level, the raise above this level would act as a headframe to house dump doors and muck bins. This would allow placement of the sheave wheels for the hoisting cable in a concrete collar right at ground level, thus eliminating a costly timber headframe and muck bins.

Shaft muck was to be stored in the 6 ft. by 8 ft. by 90 ft. long muck raise driven upwards from the No. 1 incline and hauled to the surface and dumped at regular intervals by the incline car and air hoist used in the incline driving. After shaft sinking had been completed, the muck bin was to be enlarged to act as an ore storage bin and a conveyor installed to move the crushed ore from the 100 ft. level to the surface via the incline.

## Canada's New Asbestos Project

**M**URRY MINING CORPORATION LTD., a Canadian exploration company, recently announced a new, major discovery of asbestos in the Northern Ungava region of Quebec. The area being explored is held under an exploration permit issued by the Province of Quebec and is some 30 miles south of Deception Bay on Hudson Strait.

During the past season approximately 4,000 ft. of diamond drilling indicated the presence of 3,500,000 tons of asbestos ore averaging about \$20.00 per ton at 1959 prices while an additional 3,500,000 tons is classed as inferred ore.

The Quebec Department of Mines, who have recently opened a modern \$1,000,000 ore testing laboratory, have mill tested the diamond drill cores. As reported in the Philadelphia organ *Asbestos*, the results of these tests indicate that there is approximately 12 per cent fibre in the ore and that this fibre falls chiefly into groups 4 and 5 plus some shorts. Further special tests such as maximum potential, strength unit and magnetic rating have been carried out by several asbestos producers. These tests indicate that the quality of the fibre equals or exceeds that of the southern Quebec producing area.

A more extensive programme is planned for the 1960 season, Mr. Murray Watts, president, states in the company's annual report. Over 20,000 ft. of diamond drilling, driving of an adit across the ore zone, further mapping and geophysical work and preliminary engineering studies, are to be included. Based upon the results to date it is fully expected that additional tonnages of ore will be established. Nine to ten million tons would be considered adequate to justify long-term production planning at a rate of 2,000 tons per day. Semi-permanent camps are already established on the property and 200 tons of supplies were delivered to the sea coast last autumn by ship, so that all is in readiness for an early start this spring.

Exploration results to date indicate that the project will be entirely feasible and profitable assuming that tonnage can be extended as expected. The high grade, large tonnage of ore plus the proximity of the sea for transport purposes all make the project attractive despite the relatively remote location. A yearly output of 90,000-100,000 tons of fibre is envisaged. Fibre would be transported in ships of 10,000 ton capacity with freighting costs to Europe of \$5.00 to \$6.00 per ton quoted plus loading and unloading charges.

Both the federal and provincial governments have shown a strong interest in aiding with those auxiliary facilities which will further develop the area. It is to be noted that the well known Cape Smith-Wakeham Bay nickel belt lies only ten miles south of the asbestos find and that development of transportation in the area will make these known mineral prospects very attractive. Financial assistance for the building of roads, Eskimo accommodations, airstrip, docks and communications will help make living and operating conditions reasonably competitive with more southerly mining areas. A further feature is that serious consideration is being given to employing atomic energy to supply power and heat.

It is expected that most of the fibre produced would be sold in Europe and other overseas markets. In this regard discussions are now being held with important European consumers and financial interests. Preliminary estimates indicate that the capital cost of bringing the property into production will approximate \$35-\$40,000,000 including possible government expenditures.

The Honourable W. M. Cottingham, Minister of Mines, Province of Quebec, in a recent announcement on the project stated "That new reserves should have been discovered in Ungava stresses a point often overlooked, that New Quebec is not only rich in iron ore, it has tremendous possibilities in a wide variety of minerals".



# Mercury

by

**JAMES W. PENNINGTON**

**M**ERCURY, also widely known as quicksilver, ranks tenth in quantity in world output of non-ferrous metals. However, its unusual and desirable combination of properties—liquidity at ordinary temperatures, high density, uniform volume expansion, electrical conductivity, ability to alloy readily, high surface tension, chemical stability, and toxicity of its compounds—gives mercury an industrial and military importance out of proportion to the small physical size of the production industry.

Although mercury has been known and used for over 20 centuries, until the 16th century consumption was small and chiefly in medicine. Since then mercury's applications have paralleled scientific advancements, and current principal uses of mercury are in electrical apparatus, industrial and control instruments, agriculture, pharmaceuticals, and the electrolytic preparation of chlorine and caustic soda. Other materials may be substituted for mercury in some applications; yet, for those uses that require mercury's unusual combination of physical and chemical properties, there is no ideal substitute.

## Uses

When mercury was first in demand in substantial quantities in the United States a century ago, its predominant use was for the recovery of gold; later, pigment requirements became important. These uses subsequently were replaced almost entirely by others. In recent years, high-purity mercury has been widely used in scientific and industrial control apparatus, which depend more on the physical than on the chemical characteristics of mercury.

Mercury is consumed in many pharmaceutical preparations, and in times of war, this usage increases substantially. It is an important ingredient in mercuric ointment for wounds; in antiseptics—bichloride of mercury, and mercurochrome to guard against infections; and in calomel and diuretics to cleanse the body. As dental amalgams, mercury aids in rebuilding teeth.

Mercury is used as a base material in making phenyl mercurial compounds, which are used as fungicides and bactericides to preserve textiles and for slime control in paper and pulp manufacture. Agricultural uses include germicides in treating and storing seed, in weed control, and in fungicidal fruit-tree sprays.

In industrial and control instruments, mercury is used in barometers, thermometers, manometers, and in gas-pressure and tank gauges. In recent years, considerable mercury has been used in flowmeters to indicate, register, and record the flow of water, sewage, steam, compressed air, and high-pressure gases. In some electronic computers, a tube of mercury serves as the "memory unit".

This article is abstracted from a Materials Survey, published by the Bureau of Mines, U.S. Department of the Interior, as Information

Circular 7941

In electrical apparatus, many kinds of lamps use mercury, including mercury-vapour, arc, and sun lamps. Modern mercury lamps combine the compactness and high-wattage properties of incandescent lamps and are adaptable to higher voltage supply lines than those used with incandescent lamps. This combination of characteristics makes mercury lamps of unique value in high-bay industrial, street lighting, and floodlighting applications where high mounting requires high-wattage units, and replacement costs can be minimized by a few units. In addition, mercury lamps are used in motion picture projection, photography, dental applications, heat therapy in medicine, and in sterilizing water. Other electrical applications of mercury include arc rectifiers and oscillators for use in electric furnaces; rectifier bulbs and power-control switches for motors; and various kinds of mercury switches, including wall-type switches for use in the home.

In 1944 production of a mercury dry-cell battery, whose principal characteristic is its ability to stand up under high temperatures and high humidity, was begun. Other features of the battery are its long shelf life, its ability within its rated current range to deliver the same ampere-hours service whether operated intermittently or continuously, and its much greater power for the size of unit used. The battery was developed primarily for war purposes, but it has since been perfected for peace-time use. Mercury cells are used in Geiger counters, portable radios, portable two-way communications' equipment, electronic measuring devices, digital computers, guided missiles, and hearing aids.

Electrolytic mercury cells were first employed in producing chlorine and caustic soda in the mid-1890's. This process was used on a large scale in Europe for many years, but it was not until World War II that production of chlorine and caustic soda by the mercury-cell process became widespread in the United States. Mercury combines with metallic sodium as sodium amalgam, which, in the presence of water, immediately reacts and forms metallic mercury and sodium hydrate. Rayon-grade caustic can be produced in mercury-cell plants without purification and with a caustic content up to 73 per cent without supplementary concentration.

In the manufacture of glacial acetic acid, mercury is converted to a salt that acts as a catalyst. A recent use of mercury as a catalyst is in the production of methyl styrene.

Mercury has been used in the generation of power since 1923. It is heated in one boiler, and the vapour is used to drive a turbine; the vapour is then exhausted into a second boiler to produce steam that drives a second turbine. The mercury is used in a closed circuit.

A recent new use for mercury is in precision investment castings.

Another new use is in selenium-free pigments called mercurium reds. The new pigments are comparable to the selenium-containing cadmium sulphoselenides that had been the only satisfactory heat- and light-fast red pigments available. Mercuriums are a solid solution of cadmium and mercury sulphide.

Other uses of mercury include amalgamation of gold and silver, in anti-fouling paint to protect ship bottoms, in the oil industry to maintain uniform temperatures in the distillation of oil, as a boiler compound to eradicate scale and prevent corrosion in locomotive boilers, and in the purification of metals.



Reports to the United States Atomic Energy Commission on Nuclear Power Reactor Technology in May 1953 noted that mercury was to be used in one of four experiments conducted to appraise the prospect of private industrial participation in joint production of electric energy and fissionable material from reactors.

Results of investigations on the electrolysis of carbonate-leach solutions with a mercury-cathode cell indicated that good recoveries of both uranium and vanadium were obtainable. Despite a high initial investment, the operating costs appeared favourable compared with other methods of recovery.

### World Reserves

Of 25 minerals known to contain mercury, the chief source is the red sulphide, cinnabar ( $\text{HgS}$ ). Cinnabar deposits are relatively shallow and confined to areas of late Tertiary orogeny and volcanism. Despite widespread occurrences of cinnabar, deposits of commercial importance are found in only a few countries—China, Italy, Mexico, the Philippines, Peru, Spain, the U.S.S.R., the United States, and Yugoslavia.

A tabulation of measured, indicated, and inferred ore reserves that can be recovered at a cost of about \$250 a flask is given in the table. Because only a very few domestic and foreign mines make a practice of actually blocking out ore in advance of mining, very little of the ore listed as "known" (measured and indicated) is as well delineated as is the case for the ores of major metals. On the other hand, except for the Russian estimate, all ores listed in this category have been penetrated by mine workings or drill holes, and most involve relatively short projections from larger ore bodies.

Much of the reserve is contained in the major mercury mines of the world, a few of which have accounted for perhaps as much as 80 per cent of the total production.

Mercury reserves<sup>1</sup> of the world, 1957, in thousands of 76-pound flasks

	Measured	Indicated and inferred
Alaska .. .. .	25	15
United States .. .. .	100	175
Canada .. .. .	150	150
Mexico .. .. .	30	100
South America .. .. .	4	10
Spain .. .. .	2,100	1,000
Italy .. .. .	500	1,000
Yugoslavia .. .. .	150	300
Czechoslovakia .. .. .	10	
U.S.S.R. .. .. .	3,850	500
Japan .. .. .	30	50
China .. .. .		500
Turkey .. .. .		50
Philippines .. .. .	45	45
Total .. .. .	2,000	3,900

<sup>1</sup> Minable at about \$250 a flask.

<sup>2</sup> Data inadequate and reserves known to owners may be much larger.

<sup>3</sup> Based on U.S.S.R. estimate, which seems large for amount of exploration that had been done at time of estimate.

### Mining and Extraction

Depending on the type of deposit, mercury ore is mined by either surface or underground methods. With either method mercury mining is a comparatively small-scale operation because the deposits are characteristically small and irregular in size. With the less costly surface methods, ore averaging 3 pounds of mercury per ton may be mined profitably, whereas the underground methods may require a grade of 10 pounds or more per ton.

Beneficiation of mercury ore, other than crushing to a suitable size, is seldom done. However, mercury ore may be upgraded by hand sorting, screening, jigging, tabling, or flotation. Of the various processes, flotation is the most efficient, and concentrates containing 25-50 per cent mercury with a recovery of about 90 per cent have been produced commercially.

Roasting is the conventional process used for extracting mercury from its ores and concentrates. It is essentially a distillation process in which mercury ore is heated in a mechanical furnace or retort to vaporize the mercury, followed by cooling and condensation of the vapour to liquid metal. Recovery of mercury is high, averaging about 95 per cent for furnace plants and 98 per cent for retort installations. In addition, the product—prime or virgin mercury—averages about 99.9 per cent pure which is satisfactory for virtually all uses. Dirty or contaminated mercury is cleaned and refined by filtering, oxidization or acid leaching of the impurities, or by distillation methods.

Secondary mercury is reclaimed from waste products, such as dental amalgams, sludges, used batteries, and other mercury-bearing materials, in retorts similar to those used for treating primary materials. The quantity of mercury recovered from secondary material in the United States each year is significant, and the 5,800 flasks reclaimed in 1957 represented 14 per cent of the total domestic production.

World mine output of mercury is dominated by Italy and Spain, which furnished 26 per cent and 22 per cent, respectively, of the 245,000 flasks produced in 1957. Most of the remainder is furnished by the United States, Mexico, Japan, Yugoslavia, the U.S.S.R., China, and the Philippines. About 10 other countries report minor and sporadic mercury production.

In the United States, California is the leading mercury-producing State and furnished 48 per cent of the 35,000 flasks produced in the U.S. in 1957. Of the total, Nevada supplied 18 per cent, Alaska 16 per cent, Oregon 12 per cent, Idaho 6 per cent, and Arizona, Texas, and Washington the remainder.

### Consumption and Marketing

The major part of the free-world mercury consumption is distributed among the United States, the United Kingdom, Germany, Canada, France, and Japan. In most cases, those countries depend largely on imported metal supplied by Italy, Spain, Mexico, the Philippines, and Yugoslavia.

Market quotations cover virgin metal in flasks containing 76 pounds. Producers sell the mercury through dealers, brokers, or directly to consumers. Grades of mercury other than virgin are produced by concerns that reduce impurities in mercury by redistilling or by other means.

Mercury prices tend to fluctuate widely because of erratic demands and the great adverse effect of slight overproduction. In addition, U.S. domestic prices are influenced by imports of mercury from the large, low-cost foreign producers.

The U.S. Government has enacted various legislation in an effort to stabilize and assist the domestic mercury industry. During the period of depressed mercury prices in 1922, the current import duty of 25 cents a pound or \$19 a flask was imposed on mercury. In emergency periods, such as World War II and the Korean war, price, export, import, and use controls were placed on mercury; purchase contracts were made with mercury producers; and mercury was obtained for the national stockpile. Under the Defence Production of 1950, as amended, the government advanced loans for the exploration of eligible domestic mercury deposits; established expansion goals and granted rapid tax amortization; and provided a guaranteed-price purchase programme for domestic and Mexican mercury (which expired at end 1958).

## Machinery and Equipment

# Aerial Mapping and Exploration

Radan, an electronic device now employed in aerial mapping and exploration, accurately guides the survey airplane over jungle, desert, swamp, water or ice without ground reference stations, George L. Hess, sales engineer, Aero Service Corp., United States, said at a session of the 1960 Coal Convention of the American Mining Congress. (See page 610.) In a report on the use of electronics in modern aerial mapping, Hess described the use of radan, in conjunction with a magnetometer, in a 40,000-sq.-mile survey of the Central Sahara Desert in Libya in a search for oil.

Precise line spacing and positioning were important in this survey, he said. Preliminary inspection of the area established that most of the desert lacked recognizable features ruling out accurate flight or exact reconstruction of an airborne survey by use of conventional methods. Use of radan, however, permitted the making of the geophysical survey with the magnetometer prior to or simultaneously with the mapping, thus obviating the usual delay for the completion of aerial photography.

Hess noted that most airborne geophysical and photographic surveys require a grid pattern of parallel flight lines. The radan system's computer is so built that at the end of a flight line, a signal is given to the pilot that the line is completed, a button is pressed and navigational guidance is provided the pilot for executing a turn into the next succeeding line. This sequence is repeated until the survey is completed.

### PIT PROP PALLETS

Rubery Owen and Co. Ltd., the parent company of the Owen Organization, have introduced another new pallet to their established range of products. Manufactured at their Wrexham works, where all types of pallets have been specially designed to meet the increased

demands of all industries, this new pit prop pallet contributes to handling in the mining industry.

Special features include tubular posts extendible from 24 in. to 54 in. long and easily adaptable to suit all sizes of props; safe stacking up to 5 high; space-saving storage; sturdy construction of rolled steel angle frames and solid round retaining bars; dimensions 38 in. x 32 in., and a loading capacity 25 cwt. per pallet.

The Rubery Owen palletization service covers the country.

### NEW TORQUE-FLOW PUMP

The Balfour Group of Companies (see page 629), introduce their new Scott-Wemco torque-flow pump at the Pipes and Pipelines Exhibition, Earls Court, May 30-June 2, 1960. This pump shows a big advance in pumping techniques with a new principle of construction which enables it to handle, without any clogging, a diversity of difficult materials, applicable to many industries. The principle is simple, but highly effective. A recessed impeller, located completely out of the flow pattern, imparts a swirling action to the material in transit, causing suction and discharge to become one continuous open passage from inlet to exit flanges. Particles and solids are drawn into the swirling vortex and discharged with a centrifugal sweep from the open chamber, seldom even touching the impeller.

The Scott-Wemco pump is claimed to give trouble-free performances on a wide range of materials. Sludges and slurries of high solids content, tough abrasives, soft, sticky or fibrous materials can all be handled swiftly and efficiently. It can deal with comparatively fragile substances also because there are no violent directional changes or confined passages in the flow area. A vital feature of the new pump is the minimum maintenance involved. Field tests have already covered a very wide



range of applications. This type of material can be handled without blockage and the pump will continue to work for long periods without having to be stripped down for cleaning as is the case with conventional pumps.

The simplicity of the pump's construction allows for quick and easy dismantling and replacement if necessary. Coal slurries, sand, gravel and minerals, all in the form of suspensions, can be handled with equal facility. A important feature is in the handling of crystalline slurries where there is little or no degradation of the crystals since the impeller seldom touches the material being pumped.

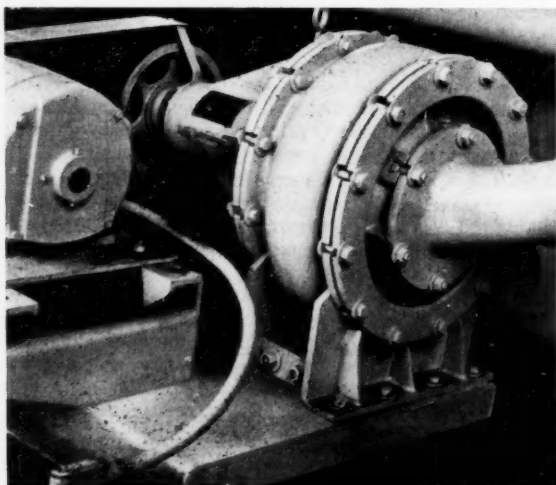
### A THICKENING-FILTERING DEVICE

A new combined thickening and filtering device, produced by Nichols Engineering and Research Corp., is said to be capable of dewatering sludges without the use of chemical flocculants, pressure or vacuum and without high filter media maintenance costs.

In this unit, called a Roto-Plug, the pulp is first thickened in a hollow cylinder having a peripheral filter medium (usually nylon) and rotating at about one r.p.m. As the drum rotates, moisture drains through the medium leaving a deposition of solids which forms a rolling mass which extends as a long plug and discharges into the second section where it is further dewatered. Here the mass is picked up on the outside of a fluted drum, which is covered with a stainless steel wedge-wire surface and further water is removed by the movement between the larger fluted drum and two smaller compression drums, the surface of which is impervious.

### FOG MAKING MACHINE

In Czechoslovakia, great attention is given in mining research to the elimination of dust. It is now reported that a device has been constructed in the Ostrava-Karviná mines called the Fog Gun which, under a pressure of several atmospheres, turns water into a fog screen. At the Petr Cingr and General Yegemenko mines, where the device is being used, the dust content of the air at the coal face has been reduced by 93-97 per cent. The miners are now said to be working under almost dust-free conditions.



Above, view of stacked Rubery Owen pit prop pallets. Alongside, at left, the new Scott-Wemco torque flow pump

# MINING MISCELLANY

The Indonesian Government has ordered foreign oil companies in the country to replace all their Dutch nationals with Indonesian citizens. Antara news agency has reported recently.

Venezuelan production of nickel is reported to have dropped by some 33 per cent, to 1,348 tons in 1959, compared with 2,002 tons in 1958.

Japanese interest in the Southern African mining industry is increasing. On May 12, the Nippon Mining Co. announced that it would send a survey team to South Africa and the Federation next month for a three-month inspection of copper resources. The mission might work out a plan for the development of the area's copper resources by means of Japanese capital and techniques. Barclays Bank D.C.C. in South Africa, says that there is a possibility of Japan participating in the financing of a refinery in the Union for the processing of iron ore being mined to the north of Thabazimbi. The bank states that the idea was mooted at the annual general meeting of Leeuwbosch Lead Mine. Although representatives of Fritzmoor Exploration (Pty) Ltd. who mine the ore and at present pay profits tribute to Leeuwbosch have said that no agreement has yet been reached, they indicated that Japanese interests might be prepared to participate in such a venture to the extent of between £3,000,000 to £5,000,000.

The Tunisian minister of industry and transport has visited Rabat, Morocco, where he had discussions which may result in a joint undertaking to exploit phosphates resources.

The Nippon Mining Co. has announced that it hopes to sign contracts shortly for the development of the Portuero copper mine in Chile and the Chapi copper mine in Peru.

An Italian mineral and chemical company will participate with 49 per cent in the capital of Actividades Mineras, Spain, formed recently with a capital of 10,000,000 pesetas to prospect for, exploit and refine minerals. The participation will be in the form of capital, technical and commercial co-operation in the extraction, refining and marketing of lithium.

Several mines controlled by the Tatabanya Mining Trust in Hungary have been fitted with high-power daylight-type strip lighting operated photo-electrically, with satisfactory results.

Mineral production in British Guiana in the first quarter of 1960, included 655 bullion oz. of gold (compared with 1,488 in the same period of 1959), and 20,192.62 (10,713) metric carats of diamonds. Increase of diamond output was mainly due to the intensified activities of river-bed recovery of gems in the Kurupung River district. Some 547,079 tons of bauxite was also produced over the same period.

Mr. Norman Manley, the Jamaican Premier, has been advised that the U.S. Department of Agriculture had been authorized to restore Jamaican bauxite to the list of strategic raw materials which can be stockpiled by the U.S. Government against barter deals for surplus agricultural products. This followed Jamaican protests against a U.S. decision late last year to remove Jamaican bauxite from this list.

New Hosco Mines, Canada, have encountered a substantial sulphide zone showing good footages of copper values, in a deep diamond drill hole well to the west of the main part of its copper ore-body on the Mattagami district property. The hole, No. 173, is a deep vertical boring and has cut the typical sulphide zone of a core length of 213 ft., extending from 1,264-1,477 ft. No assays are yet available, but a 41 ft. core length from 1,365-1,406 ft. is visually described as carrying "good copper" values. Deeper, another 37 ft. section from 1,440-1,477 ft., is visually estimated to carry "fair copper" values. A short section of good zinc values was also encountered shallower in the hole.

Phosphates are one of the principal items to be exported from Tunisia to East Germany under their first official trade agreement.

The East Pakistan Government has drawn up plans for the development of the salt industry, at an estimated expenditure of Rs.640,000, aimed to achieve self-sufficiency in salt in East Pakistan during the second 5-year plan.

The European Court of Justice at its recent meeting in Luxembourg rejected an appeal by 18 Federal German iron ore and steel undertakings for the withdrawal of a decision, made on February 9, 1958, by the High Authority of the European Coal and Steel Community. This High Authority decision called for the scrapping of special rail tariffs of the German Federal Railway for the transport of mineral fuels and iron ore to be used by the iron and steel industry, claiming that it was discriminatory against other undertakings. The Court awarded costs against the appellants.

France's iron ore producers sold a total of 60,550,000 tonnes of ore in 1959, or 4.84 per cent more than in 1958. Production rose by only 2.46 per cent, to an annual figure of 60,900,000 tonnes. Stocks rose further over the year to a level of 5,180,000 tonnes. A breakdown of sales shows an increase of 4.63 per cent in those to domestic steel industry and 9.28 per cent to the Belgian industry. Producers in Western France, raised domestic sales by 15 per cent and sales to Belgium by 25 per cent, at the same time as building up output. The national iron ore syndicate states that modernization and mechanization plans in the industry are now being completed in ore mining, and that output will be able to be increased rapidly if further demand from home or foreign markets warrant it.

The total output from the mines operated by the Nigerian Coal Corporation was 905,397 tons, states the Corporation in its annual report for the year 1958-59. This was the highest on record and an increase of 58,870 tons compared with the previous year, in spite of output having to be curtailed from the month of November owing to falling off in demand. During the next financial year output from the Corporation's mines will need to be reduced by approximately 150,000 tons. Obwetti produced 342,359 tons, being a reduction of 32,082 tons from the previous year. This reduction is due to the gradual exhaustion of coal reserves in the South Side and is part of the planned programme in which Obwetti will go out of production in four or five years. Hayes produced 207,725 tons—an increase of 37,799 tons. At Ekulu development continues satisfactorily and much of the work is ahead of schedule. The mine produced 20,046 tons during the year and by the end of the coming financial year ought to be producing 1,000 tons a day. The policy of Nigerianization within the service of the Corporation continued. A Nigerian acting-manager at Hayes Mine was confirmed in his appointment and a Nigerian was also appointed under-manager at the same mine.

Kennecott Copper Corporation has formally dedicated its new \$30,000,000 copper refinery at Hawkins Point, Maryland, south of Baltimore. Mr. C. R. Cox, president of Kennecott, said that the refinery's completion would enable the company to do all its own refining. The refinery is currently processing 10,000 tons a month, and has a designed capacity of 16,500 tons.

President Alessandri of Chile is to place before Congress a project to grant greater investment facilities and guarantees to increase expansion of the copper mining industry. He announced that negotiations were under way with Anaconda, Braden (Kennecott) and Cerro de Pasco for a \$400,000,000 plan for the enlargement of the Chuquibambilla plants, building a refinery in Chancay, north Chile, and increasing output from the Rio Blanco copper deposit. The projected grant would depend on agreement being reached with these companies.

The Kingdom of Morocco is to increase phosphate deliveries to China to 600,000 tonnes during 1960, compared with 100,000 tonnes in 1959.

Ruhr coal miners' managers decided recently in Essen to lodge a fresh application with the European Coal and Steel Pool's High Authority for a central sales organization, their earlier appeal having been turned down last December. In case of another rejection, the Ruhr mine owners decided to ask the High Court of the European Community to clarify whether the Coal and Steel Pool treaty permitted setting up a central sales organization. West Germany's coal industry has stated repeatedly that it needs such an organization in order to meet mounting competition, especially from oil.



## Question-Mark Over Nicaro Nickel

Fears of a Cuba-Soviet deal for the barter of nickel have been roused by the action of the Cuban Government in holding up a shipment from the Nicaro plant.

The U.S. Government has refused to pay the 25 per cent *ad valorem* tax imposed by the Castro Government last year on all ores and metals exported from the island, which came into force in March, 1960, after a 90-day moratorium. The tax has already led to the closing down of the nickel and cobalt installations under construction by Freeport Sulphur. The U.S. Government has refused to agree to it, basing its refusal on the agreement of 1952, which excludes the U.S. from Cuban taxes on its Nicaro plant. This agreement, however, has never been ratified by the Castro Government. It was decided to send a cargo vessel to the Nicaro plant in April, but the Cuban Government has refused to give customs clearance to the ship because of the tax dispute.

The Nicaro plant represents an investment of nearly \$100,000,000 by the U.S. and is the second largest plant of its kind in the Free World. Some 1,500 s.tons of nickel are processed each month under the supervision of officials of the General Services Administration.

It remains to be seen what action the U.S. Government is now prepared to take. Fortunately for the U.S. the expansion of Canadian output, and especially the approaching start of production from Inco's huge new project at Thompson, Manitoba, has averted what would otherwise have been the possibility of a serious shortage of this strategic metal. Preparatory mining, milling and smelting operations at Thompson have been scheduled for the second half of 1960, and refining operations for early 1961.

A disquieting aspect of the situation is that, if GSA's Nicaro plant is denied shipping privileges and the plant is confiscated, a contingency that has apparently been given serious consideration in Washington for several months, there seems to be every likelihood that the Cubans will make a nickel deal with the Soviet Government or one of its satellites. Soviet emissaries have visited Cuba since the advent of the Castro Government, and ever since there has been speculation as to what kind of transactions might be pending.

Under the terms of a Polish-Cuban trade agreement signed in March, Cuba is to export copper, iron, nickel, chrome and manganese to Poland.

### ALUMINIUM IN THE E.E.C.

Virgin aluminium output by the European Economic Community countries in 1959 amounted to some 441,300 tonnes, or about 11 per cent of total world production, according to a report issued by the E.E.C. Statistics Office. Consumption figures for last year are not available, but in 1958 the E.E.C. countries used 447,300 tonnes of virgin aluminium.

The largest producer within the Community was France, which in 1959 produced 169,100 tonnes (excluding the output of the African company Alucam). She was followed by West Germany with 151,100 tonnes and Italy with 74,000 tonnes.

The wrought aluminium output of the E.E.C. countries in 1959 amounted to some 190,000 tonnes, compared with 173,600 tonnes in 1958. The E.E.C. output of semis totalled 355,900 tonnes, of which some 80,000 tonnes were exported.

The report concludes that, while the E.E.C. countries are assured of sufficient aluminium for their needs, they should build new aluminium smelters in order to reduce their dependence on imports.

In his address to the meeting of Pechiney shareholders the chairman, M. Raoul de Vitry, called for a more liberal price scheme in France. He pointed out that the company's chief competitors abroad were able to cope with the heavy investments required, particularly in the chemical and aluminium industries, because they enjoyed a lower interest rate and a more liberal price scheme. Reference was also made to the fact that the French industry had asked the government for an increase in price, and that this was still under consideration. M. de Vitry declared that his company had nothing to fear from a reasonable speeding up of the Common Market schedule.

The company's turnover for the first four months of this year was 19 per cent above that for the same period of 1959.

The U.S. aluminium industry is producing primary metal at a near-record rate and could set new production records during the second quarter of this year, reports the *American Metal Market*. The steady uptrend in productivity since the start of the year has continued into the second quarter with no signs of levelling off until mid-year—if then.

A cable just received states, however, that production of primary aluminium in the U.S. fell in April to 168,596 s.tons from 170,688 during March. This figure—though well below the record of July, 1959, when 179,194 tons of aluminium were produced—is substantially higher than the level of April, 1959, when output was 155,213 tons.

The Kaiser Aluminium Chemical Co. is at present carrying out negotiations with the provincial government of the Argentine state of Santa Cruz for the long-term purchase of natural gas for the feeding of an aluminium plant planned to be erected near Puerto Deseado. Capital investments of some \$U.S.28,000,000 are expected to be spent on the projected installation. Hitherto the Argentine has been dependant on imported aluminium.

### WOLFRAM STILL RISING

Wolfram ore shipment prices continue to move ahead and are now indicated at 152s. 6d. to 157s. 6d. per 1-ton unit c.i.f. Europe, which compares with 147s.-152s. a week ago. Traders report a useful rate of sales at varying prices within the current range, Japan and the U.S. being among the countries displaying buying interest. Continental enquiry has also been an important market feature.

It remains to be seen how far the upswing has been due to political considerations and how far to actual needs, but the former appear to have been only a minor factor.

Particularly encouraging are the latest tungsten statistics issued by the Bureau of Mines, U.S. Department of the Interior. These show that U.S. domestic consumption in February amounted to 1,266,000 lb., being an increase of no less than 36 per cent over the January figure of 813,000 lb. Imports for consumption in February totalled 645,000 lb., being 84 per cent higher than the January total of 350,000 lb.

### QUIET PLATINUM MARKET

Quiet but steady conditions continue to characterize the free platinum market in the U.K. Prices remain at £28 5s. to £28 15s. per troy oz., while the official quotations of £30 5s. to regular customers remains unchanged. Similar conditions apply in the market for free supplies of palladium, which is still indicated at around £8 5s., the U.K. refiners' price being £9 7s. 6d.

The U.S. free platinum market has also settled down to an extremely quiet pace with demand and consumption unimproved and prices stable. Leading refiners still adhere to their officially advertised offering levels of \$82 per troy oz. in bulk or \$85 in lesser quantities. Meanwhile, dealers on the outside market are apparently still making offerings at \$80.50.

### U.S. COBALT CONSUMPTION

Consumption of cobalt in the U.S. increased to 9,898,702 lb. in 1959, according to the Bureau of Mines, Department of the Interior. This was the highest consumption since 1953 and was 31 per cent more than in 1958 and 14 per cent above the average for the five years 1954-58. The only decreases in consumption for the year were a 13 per cent decline for cutting and wear-resisting materials and a 20 per cent drop in consumption for pigments. Consumption of cobalt metal and oxide in 1959 increased by 41 and 16 per cent respectively, but purchased scrap was 27 per cent lower than in 1958.

### URANIUM IN FINLAND

The Paukanjanvaara mining company of Eno, Finland, is this month to start full-capacity exploitation of uranium deposits at Eno, Askola and Perna. Annual throughput of the plant—the first of its kind in northern Europe—is given as 30,000 tonnes of crude ore with a uranium content of 0.2 per cent. The extraction unit has just been completed. The plant will export to Sweden and negotiations are taking place with interests in Federal Germany and other western European countries. Exploration for further deposits is being continued.



**COPPER • TIN • LEAD • ZINC**

(From Our London Metal Exchange Correspondent)

No significant developments have taken place during the period under review to disturb the general price structure of the market. A firm undertone has been maintained in consideration of certain background factors and until such time as these are resolved one way or the other, no material change in these conditions can be expected.

**COPPER OUTLOOK DEPENDS ON CHILE AND CONGO**

European consumers have shown appreciably more interest during the week with sales of physical metal at a satisfactory level. Whilst in this respect the situation in Chile is a prominent factor, the trade generally is inclined to place more emphasis on the unrest in the Belgian Congo and the overall uncertainty for the future after the granting of independence at the end of next month.

As far as Chile is concerned, further direct negotiations are scheduled between Anaconda and the Union in a fresh attempt to resolve the strike at the El Salvador and Potrerillos smelter. The union is demanding a 58 per cent wage increase made up of the 35 per cent authorized by law plus an additional 23 per cent and fringe benefits, whilst the company has offered the 35 per cent plus 15 per cent. A one-day solidarity strike by workers at the Braden and Chuquibambilla mines, scheduled for Monday, was called off owing to the

earthquake in Chile but an indefinite stoppage at these properties was due to start later in the week if no solution had been reached in the other dispute.

Against a background of these developments, London quotations have moved higher although the nearby price has been held in check by a further substantial increase in U.K. official warehouse stocks of 429 tons bringing them up to 3,918 tons. In the middle of the week, however, a sharp downward reaction developed initiated by substantial offerings of nearby metal and disappointing U.S. reports. Statistics issued during the week show that consumption of copper in all forms in the U.K. in March totalled 67,982 tons compared with 61,587 tons in February and stocks of refined and blister copper again decreased from 55,979 tons to 52,477 tons.

In the U.S. there has been no improvement in consumer buying and conditions remain quiet, particularly in the custom smelters' field where the price is maintained at 33 c. There has been little business in the export market but these sources expect June shipments to improve on implementing previous overseas contracts. Producers' sales by contrast for June delivery have been maintained at a satisfactory level.

Domestic consumption of copper by brass and wire mills and foundries in the U.S. in April increased to 113,619 tons compared with 108,881 tons in March and new business booked by fabricators totalled 90,220 tons against 77,351 tons. Fabricators' stocks of refined copper at

the end of April, however, amounted to 457,070 tons against 441,026 tons. Mine production of copper in March, which was the first full month after resumption of operations following the prolonged strike, at 95,700 tons showed an increase of 27 per cent over February's figure and stocks of refined and unrefined copper totalled 319,400 tons compared with 269,300 tons.

**TIN EASIER**

In spite of some improved buying on the part of U.S. consumers, the tin market has failed to maintain recent levels in anticipation of arrivals of Straits tin and quiet Continental demand. The U.N. Tin Conference has opened in New York where delegates are discussing the draft of a proposed new International Tin Agreement. U.K. stocks last week increased 216 tons to 8,179 tons. Refined tin consumption in the U.K. in March improved to 2,191 tons from 1,879 tons in the previous month, whilst comparative stock figures were 10,677 tons against 10,240 tons.

On Thursday the Eastern price was equivalent to £790½ per ton c.i.f. Europe.

**LEAD AND ZINC**

In spite of the expected early arrival of foreign supplies, lead values have been maintained in consideration of satisfactory U.K. consumer off-take whilst in the case of zinc, although consumption is held at a satisfactory level the market has been less assured and a small contango has again developed in consideration of the adequacy of nearby supplies at the moment.

March consumption of lead in the U.K. showed a very satisfactory increase at 35,066 tons compared with 30,241 tons in February and U.K. stocks declined from 42,043 tons to 41,248 tons. Zinc consumption in March was also at a good level at 35,268 tons compared with 30,480 tons in February but stocks increased from 48,689 tons to 51,064 tons.

The stoppage at the Broken Hill plant continues and a strike vote is imminent at the Walloe, Idaho plant of the American Smelting and Refining Co. In the U.S., lead sales last week were again at a good level, exceeding 10,000 tons, but conditions in the zinc market were quiet. In Canada the Consolidated Mining and Smelting Co. have increased their prime western zinc quotation by ¼ c. to 13 c.

Closing prices are as follows:

	May 19		May 26	
	Buyers	Sellers	Buyers	Sellers
<b>COPPER</b>				
Cash .. ..	£250	£250½	£240½	£241
Three months ..	£246½	£246½	£239½	£239½
Settlement ..	£250½		£241	
Week's turnover	13,525 tons		13,650 tons	
<b>LEAD</b>				
Current ½ month	£77½	£78	£77½	£77½
Three months ..	£77½	£77½	£77½	£77½
Week's turnover	15,025 tons		6,200 tons	
<b>TIN</b>				
Cash .. ..	£785	£785½	£783½	£784
Three months ..	£785	£785½	£783½	£784
Settlement ..	£785½		£784	
Week's turnover	645 tons		365 tons	
<b>ZINC</b>				
Current ½ month	£92½	£92½	£90½	£90½
Three months ..	£92½	£92½	£90½	£91
Week's turnover	5,875 tons		2,850 tons	

**LONDON METAL AND ORE PRICES, MAY 26, 1960****METAL PRICES**

Aluminium, 99.5%, £186 per ton	Manganese Metal (96% 98%) £275/£285
Antimony .. ..	Magnesium, 24.2d./25.3d. lb.
English (99%) delivered, 10 cwt. and over £190 per ton	Nickel, 99.5% (home trade) £600 per ton
Arsenic, £400 per ton	Osmium, £22/£24 oz. nom.
Bismuth (min. 1 ton lots) 16s. lb. nom.	Osmiridium, nom.
Cadmium 10s. 6d. lb.	Palladium, Imported, £8 12s. 6d.
Cerium (99%) net, £16 0s. lb. delivered U.K.	Platinum U.K. and Empire Refined £30 5s.
Chromium, Cr. 99% 6s. 11d./7s. 4d. lb.	Imported £28½/28½
Cobalt, 12s. lb.	Quicksilver, £70½/£71 ex-warehouse
Germanium, 99.99%, Ge. kilo lots 2s. 5d. per gram	Rhodium, £45½/£48 oz.
Gold, 250s. 34d.	Ruthenium, £16½/£18 oz. nom.
Iridium, £23/£25 oz. nom.	Selenium, 50s. 0d. per lb.
Lanthanum (98%/99%) 15s. per gram.	Silver, 79½d. f. oz. spot and 79½d. f'd
	Tellurium, 21s. 6d. lb.

**ORES AND OXIDES**

Antimony Ore (60%) basis .. ..	19s. 6d./21s. 6d. per unit, c.i.f.
Beryl (min. 10 per cent BeO) .. ..	230s./235s. per l. ton unit BeO
Bismuth .. ..	65% 8s. 6d. lb. c.i.f.
	18/20% 1s. 3d. lb. c.i.f.
<b>Chrome Ore—</b>	
Rhodesian Metallurgical (semifriable 48%) (Ratio 3 : 1) .. ..	£15 5s. 0d. per ton c.i.f.
Hard Lump 45% .. ..	£15 10s. 0d. per ton c.i.f.
Refractory 40% .. ..	£11 0s. 0d. per ton c.i.f.
Small 44% .. ..	£13 5s. 0d. per ton c.i.f.
Calcutta 48% .. ..	£11 15s. 0d. per ton f.o.b.
Columbite, Nigerian quality, basis 70% combined pentoxides (Ratio 10 : 1) .. ..	17s. 10s./18s. per l. ton unit c.i.f.
<b>Fluorspar—</b>	
Acid Grade, Flotated Material .. ..	£22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF <sub>2</sub> ) .. ..	156s. 0d. ex. works
<b>Lithium Ore—</b>	
Petalite min. 34% Li <sub>2</sub> O .. ..	47s. 6d./52s. 6d. per unit f.o.b. Beira
Lepidolite min. 34% Li <sub>2</sub> O .. ..	47s. 6d./52s. 6d. per unit f.o.b. Beira
Amblygonite basis 7% Li <sub>2</sub> O .. ..	75s./85s. per ton f.o.b. Beira
Magnesian, ground calcined .. ..	£28 0s./£30 0s. d/d
Magnesian Raw (ground) .. ..	£21 0s./£23 0s. d/d
<b>Manganese Ore Indian—</b>	
Europe (46% 48%) basis 67s. 6d. freight .. ..	73d./75d. c.i.f. nom.
Manganese Ore (43% 45%) .. ..	69d./71d. c.i.f. nom.
Manganese Ore (38% 40%) .. ..	71d. c.i.f. nom.
Molybdenite (85%) basis .. ..	8s. 11d. per lb. (f.o.b.)
<b>Titanium Ore—</b>	
Rutile 95/97% TiO <sub>2</sub> (prompt delivery) .. ..	£28 0s. 0d. per ton c.i.f. Aust'n.
Ilmenite 50/52% TiO <sub>2</sub> .. ..	£11 10s. per ton c.i.f. Malayan
Wolfram and Scheelite (65%) .. ..	152s. 6d./157s. 6d. per unit c.i.f.
Vanadium .. ..	
Fused oxide 95% V <sub>2</sub> O <sub>5</sub> .. ..	8s./8s. 11d. per lb. V <sub>2</sub> O <sub>5</sub> c.i.f.
Zircon Sand (Australian) 65-66% ZrO <sub>2</sub> .. ..	£16/£16 10s. ton c.i.f.

## Mining Finance

# Anglo American's Huge Investments

A figure of £413,000,000 in the 76-page annual report for 1959 of Anglo American Corporation of South Africa perhaps gives more than any other some idea of the magnitude of this mining finance enterprise. It represents the market value on December 31 last of the quoted investments held by the corporation, its subsidiaries and its associated finance companies. Investments which had a balance sheet value on that date of £129,000,000. There will, of course, have been "considerable" deflation of the market value since the end of 1959. Presumably Mr. Oppenheimer will dwell on this in more detail in his pending annual statement. The fall may have been around 20 per cent. This would still leave the market value at the huge figure of £330,000,000.

Anglo American's consolidated profit for 1959 (not given in the preliminary statement) was £7,736,557 after tax compared with £7,181,537 in the previous year. The amount available for Ordinary dividends after deducting the payments on the Preferred stock comes out at £7,593,795 of which the higher distribution of 9s. per 10s. Ordinary share already announced on an increased capital absorbs £4,738,520. Thus general reserves get a million more at £3,535,309 and the carry-forward is £319,427 down at £703,706. It is stated that starting in 1960 it is intended to reduce the present disparity between the interim and final dividends which for 1959 were respectively 2s. and 7s.

Anglo American's income picture for the current year is a good one providing that Africa's racial disturbances do not disrupt mining operations. So far they have not done so, and there is no evidence that they will. There will be more from copper and diamonds as well as from the newer gold mines. So in view of the good cover for the higher 1959 dividend there is every reason to expect that Anglo will at least maintain this rate in 1960 on which basis the yield at the present price of 158s. 9d. is 5.7 per cent before allowing for double tax relief.

There are a number of other interesting points that can be culled from this bulky report. One is the welcome given to the removal of the undisturbed profits tax in the South African Budget. A number of South African investment and finance companies were dependent for their exemption from this tax on the fact that more than half the nominal value of their issued capitals was held by non-Union shareholders. Owing to the big repatriation of South African stocks that has taken place during the overseas selling precipitated by the racial troubles some of these concerns were in danger of losing their exemption on these grounds.

A plea is made for a reduction in gold-mining taxation. The industry, it is stated, remains concerned at the exceptionally high rate of tax to which the mines become liable when their capital expenditure has been amortized. In 1959 it is estimated that the industry paid £27,000,000 in tax and government share of profits and "over the next few years this figure is likely to increase considerably".

Diamonds are, of course, a vital part of the Anglo American set-up but up until last year the corporation strangely enough had no direct interest in De Beers, only an indirect one through its holding of Anglo

American Investment Trust which owns 20 per cent of the De Beers Deferred capital. Now, however, as a result of converting its loan to De Beers into Deferred shares Anglo has a direct holding of 700,000.

In copper it is stated that production of the Northern Rhodesian mines including the R.S.T. group was a record in 1959 at 530,604 tons and sales were valued at £115,400,000.

## SELECTION TRUST PAYS THE SAME

Any commentator cogitating in advance about the probable results for Selection Trust in the year to March 31 last could hardly have been wrong in his conclusions. He would have looked at the unchanged dividend from one of the company's major holdings, American Metal Climax. Added to this the same payment from Vaal Reefs, more from Western Holdings and a little less from Consolidated African Selection Trust and the conclusion must be that profits would be little different from those for 1958-59. Therefore the dividend was also likely to be the same. In the event he would have been dead right.

The consolidated net profit after allowing for a tax adjustment comes out at £1,705,215 against £1,682,424 and the dividend is again brought up to 7s. per 10s. unit with a final of 5s. 3d. The payment requires £1,112,972 out of an available £1,675,152. Thus the allocations to reserves are again £550,000. The carry-forward is raised by £84,347 to £870,090.

The outlook for Selection Trust, which is presided over by Mr. A. Chester Beatty, is promising provided that the Rhodesian copper industry continues unscathed by racial disturbances. The trust's interest here is through American Metal Climax which controls Rhodesian Selection Trust and has a substantial stake in Roan Antelope. A.M.C. stepped up its U.S. earnings last year and should do even better in 1960. There is a strong indication, in fact, that it may be more generous in its dividend this year.

Selection Trust may consequently be valued on a minimum 7s. dividend to give a yield at 92s. 6d., cum the final dividend, of 7.8 per cent. They were 126s. 3d. earlier this year.

## MURCHISON TO EXPAND DEVELOPMENT

The 1959 report of Consolidated Murchison, the South African antimony producer, is chiefly notable for the remarks of the chairman, Mr. S. G. Menell, about the development situation. He says that the tonnage mined last year came entirely from the Gravelotte section of the property which has been the main source of supply for the past ten years. Development there continues to be well ahead of mill requirements, but, although by no means exhausted, the section has a "limited life". Consequently the company has intensified its exploration programme and is to further expand these activities in the current and future years. In this connection additional mining ground covering 1,032 base-metal claims in the Letaba district have been acquired.

It is to be presumed that this programme will mean an increase in working costs to which development expenditure is charged. The amount spent on development last year did, in fact, go up from £35,775 to £56,759, but on a per ton basis there was actually a decrease from 9s. 7d. to 7s. 7d. This was because of Murchison's higher production. Cobbed ore and concentrates produced rose from 12,859 tons to 22,155 tons with an average antimony content of 61 per cent.

Mr. Menell says that there was a ready sale for the 1959 production and that during the latter half of the year the mine operated at full capacity. Sales have shown some falling off during the first three months of the current year as last month's quarterly showed, the profit being £138,198 against £211,251 in the December quarter. It was still, however, slightly above the quarterly average of £127,000 for the whole of 1959.

Murchison's interim for 1960 is due to be announced next month. The 5s. shares are 47s. 6d. to yield over 17 per cent, even without taking double tax relief into account, on the 1959 total dividend of 8s. 3d. The shares tend always to offer a high return owing to the uncertainties and fluctuations in the demand for antimony. The price at the moment is also depressed by the common denominator affecting all South African stocks, namely the racial troubles there.

## WINKELHAAK'S NEW SHAFT

The annual meetings of the South African gold mines in the Union Corporation group were of chief interest to shareholders in Winkelhaak, the first company to produce gold from the new Kinross field, situated well to the east of the Eastern Rand. This concern, which started production in 1958, now feels sufficiently well established to start looking ahead to a markedly higher milling target. At the moment an expansion in the plant capacity to 90,000 tons monthly is approaching completion. Last month 83,000 tons were milled. An eventual 150,000 tons a month is now being considered. But first a new shaft will be needed to open up the deeper north-eastern part of the property. It is proposed to start sinking this, the No. 2 shaft, early next year. It will be sited some 6,000 ft. north-east of the existing No. 3 shaft and will be put down to 4,300 ft.

Its financing is bound to have some effect on dividend prospects. The estimated cost is "something under" £2,500,000 spread over three and a half years or so. Then in due course there will be the additional cost of enlarging the mill and providing the necessary expansion of services. No estimate is given of this. But the chairman, Mr. T. P. Stratton, does say that it should be possible to find the money out of profits assisted where necessary by temporary borrowing from Union Corporation and "still leave enough to enable an early start to be made with dividend declarations".

Winkelhaak 10s. shares have improved to 21s. following the news. It is obviously being hoped that a maiden dividend will be forthcoming on account of 1960, possibly even next month, but more likely next December. It is hardly likely, of course, to be anything more than modest in amount.

## PACIFIC ISLAND'S PROGRESS ON MISIMA

Pacific Island Mines' Misima operations, covering some 60 acres of the total 13,000 acres held, have continued to locate further extensions to the new lode system found earlier this year. Detailed testing in the oxidized zone has exposed three lodes spaced some 300 feet apart.

Gold values, the company says, appear to be persistent and in places encouraging values have been encountered. Operations are insufficiently advanced to permit an estimate of average grade and tonnage to be made at this stage, but work already done indicates that the lodes have minimum combined surface length of 1,500 feet and extend to a depth of at least 150 feet. Exposed lode widths range from 5 to 45 feet. The nature of the ground and gold occurrences should permit cheap mining costs in the oxidized zone.

In addition to the higher grade structures, there are very large tonnages carrying lower gold concentrations. This ground may prove to be economic to work on a large scale by open-cut methods.

Total operating costs have been kept to a minimum and, as a result, the company has sufficient funds to maintain operations on the present scale.

However, in view of the low capital structure of Pacific Island and desirability of commencing productive operations as soon as possible, it is proposed to instal a small production unit and to expand the current prospecting operations into new territory on Misima. The plant will initially operate on a pilot plant scale to determine ore reserves and most efficient treatment processes. Later the plant could be modified into a full scale production unit to treat 40-50 tons of oxidized ore per day.

The expanded testing programme and subsequent productive operations on the above-mentioned basis will be financed by the new one for one issue to existing shareholders, the terms of which were disclosed earlier this month.

Austral Malay Tin is to take a share-holding in Pacific Island. Following negotiations, Pacific Island will make an issue to that company of 1,000 shares, payable in cash at par after the current issue.

\*

**Special Dividend from Pusing.**—Pusing Rubber and Tin have declared a special dividend of 6s. per share free of tax, to be paid exclusively out of the capital profit arising from the sale of the company's Malayan properties.

## LONDON MARKET HIGHLIGHTS

After two more days of lethargy, the Kaffir market has begun to show some quite impressive signs of strength in the last few days. Stock continued to be in short supply, and with most centres coming in as buyers, many prices reacted strongly. Typical rises on the best day of the rally were Free State Geduld 5s. 7½d., Western Holdings 5s., Vaal Reefs 1s. 10½d., and Stilfontein 1s. 9d.

Although succeeding days did not bring improvements of the same magnitude, many useful gains were to be seen. Saint Helena closed at 68s. 9d., 4s. 9d. better on the week, Libanon put on 1s. 6d. to 14s., while F.S.G. ended the week at 128s. 9d., an improvement of 11s. on the week's dealings.

Nor was this recovery confined to Kaffirs. De Beers (153s. 9d.) began to improve soon after the publication of the annual report. When Kaffirs began to advance, De Beers gained added strength, and on successive days put on 1s. 3d., 2s. 6d., 5s. and 6s. 3d., a total of almost 15s.

Finance houses and investment companies also shared in the general improvement. Gold Fields (64s. 6d.) were consistently strong in anticipation of the interim. Ofits (80s.) followed the rise in its underlying securities, while Consolidated Mines Selection (31s. 9d.) were in demand. Exceptionally, Anglo American eased slightly after the annual report was published, though earlier rises enabled them to close at 158s. 1½d., 6s. better on balance.

The situation in coppers was similar to that in golds. Stock was in short supply, and a limited amount of buying had marked effects on share prices. Nchanga especially

was in demand from London, and Johannesburg finishing almost 7s. up at 58s. 9d. Also firm was Messina, which finished at 22s. ex the four-for-one scrip issue.

Rio Tinto came into demand from Brussels from time to time, but Selection Trust behaved unaccountably. In front of the annual results, the shares rose very smartly, touching 97s. 6d. at one time after having been 88s. 1½d. last week. After the results were published, however, the shares began to recede quite sharply, in spite of the fact that the profits and dividend were much in line with expectations. The close saw them still looking dull at 92s. 6d.

Tin shares ran into a spell of profit-taking at the beginning of the period, and this was accentuated by some uncertainty connected with the opening of the New York Conference. Eastern demand soon revived however, and prices picked up to such, good effect that Ayer Hitam reached a new peak of 90s. Others in demand from the East were Tronoh (35s. 6d.), Tanjong (24s. 6d.), Malayan (24s. 3d.) and Sungei Besi (26s. 6d.). Beralt (32s. 3d.) were another bright spot in response to the improved wolfram price.

Elsewhere, Ghana golds had one of their sporadic bursts of strength, and several shares, notably Ashanti (20s.) went better for a time. St. John d'el Rey, a counter perennially acutely short of stock, put on 7s. 6d. to 127s. 6d. on the news concerning the disposal of the company's unprofitable gold mine. Lead-zincs were dull throughout, the only significant movement being in R.B.H. notes which gradually gained strength to finish at 4½d. premium. The shares moved in sympathy, closing at 10s. 1½d.

## Personal

Dr. Davidson Nicol has been appointed Principal of Fourah Bay College, the University College of Sierra Leone.

\*

The Canadian Institute of Mining and Metallurgy has presented the Norwegian metallurgist, Anton Gronningsaeter with the Platinum Medal of the International Nickel Co.

## Company News

As from May 13, Head Wrightson Colliery Engineering Ltd., is now to be known as Head Wrightson Mineral Engineering Ltd. Their previous address and telephone numbers remain unchanged.

\*

Niagara Screens (Great Britain) Ltd., have announced that they are in future to be known as Niagara Screens and Plant Ltd. Their address remains unchanged.

\*

Holman Bros., of Cornwall has been selected by a group of American mining experts to receive a 1960 "Blue Ribbon Mining Award" for outstanding achievement in equipment development aiding the technological advancement of mining. The award, sponsored by the American Mining World and World Mining, is in respect of the Holman Rotair portable screw-type rotary compressor.

\*

The National Coal Board have appointed Mr. A. S. Bean, as marketing director, and Mr. F. H. Newman, as finance director, of their Durham Division. These appointments have been made to fill the vacancies caused by the recent death of Brigadier C. D. Marley, D.S.O., and the late Mr. S. J. Reid.

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# THE CENTRAL MINING — RAND MINES GROUP

Extracts from Chairmen's Statements circulated to Shareholders

(Reports of the proceedings will be made available on request to the London Secretaries—A. Moir & Co., Ltd.,  
4 London Wall Buildings, London, E.C.2.)

## TRANSVAAL CONSOLIDATED LAND AND EXPLORATION COMPANY LIMITED

(Incorporated in  
the Union of South Africa)

The Sixty-fifth Ordinary General Meeting of shareholders was held on May 24, 1960. The following is an extract from the circulated Statement by the Chairman, **Mr. T. Reekie**, dated May 17, 1960.

The profit before taxation amounted to £359,903, which was £23,755 higher than the figure for 1958. To meet the Company's net tax liabilities, an amount of £84,170 was provided, while dividends declared in 1959, which were increased from 4s. 3d. to 4s. 6d. per share, totalled £209,304. The balance of the Income and Expenditure Account was increased by £66,429 to £512,857. The net current assets of the Company, excluding those of subsidiary companies, decreased from £452,123 at the end of 1958 to £350,228 at the end of 1959, which is principally due to the net increase during the year in the investment portfolio of approximately £159,000, to which reference is made later.

The production of high-grade coal from the Colliery continued throughout the year. Coal despatched decreased by 84,995 tons to 584,155 tons with a consequent effect on the working profit which, at £165,890, was £16,133 lower. A general decline in the scale of orders was mainly responsible for the lower output, and production was also affected by occasional shortages of railway trucks. It is, however, considered that the stockpiles of coal held by the railways, power stations and industrial and commercial undertakings have now been reduced to a level where some improvement in orders may be anticipated, especially during the coming winter months. The sales output for the first four months of 1960 was 208,503 tons which reflects an increase of 5,634 tons compared with the output for the same period in 1959.

The export market has become highly competitive, with large stocks and over-production in Europe and America and expanding production in the East. There has been some difficulty in making a re-entry into this trade under such conditions, but it is encouraging to report that the Transvaal Coal Owners' Association, of which this Company is a member, has recently managed to secure some export trade with Eastern countries for the shipment of high-grade steam coal; it is to be hoped that this business will prove to be the forerunner of further export orders.

With the general improvement in the railway transport position, all subsidized transportation of coal by road ceased as from January 1, 1960.

Production and sales of chrome ore by Winterveld (T.C.L.) Chrome Mines (Proprietary) Limited and Rooderand

Chrome Mine (Proprietary) Limited continued at a satisfactory level although the average market price at which ore was sold during the year continued to decline.

Royalties from certain of the Company's mineral properties let on tribute for the mining of asbestos, chrome and tin totalled £138,948 compared with £133,233 in the previous year. Expenditure during the year on exploration and ventures amounted to £17,711, as compared with £6,692 in 1958, and was incurred principally on the geological examination of certain of the Company's holdings which, although previously known to have mineral possibilities, required to be more closely examined in the light of current market conditions for base minerals.

During 1959 the Company increased its investment in a number of existing holdings and extended its portfolio by the inclusion of shareholdings in Western Areas Gold Mining Company Limited and Western Deep Levels, Limited.

The spread of the quoted investments based on the respective market values at December 31, 1959, is — gold mining companies — 86 per cent; investment companies — 8 per cent; industrial companies — 4 per cent; coal mining companies — 2 per cent.

During 1959, dividends accrued from investments totalled £108,256 compared with £82,088 during the previous year.

## DURBAN ROODEPOORT DEEP LIMITED

(Incorporated in  
the Union of South Africa)

The Sixty-third Ordinary General Meeting of shareholders was held on May 23, 1960. The following is an extract from the circulated Statement by the Chairman, **Mr. T. Reekie**, dated May 16, 1960.

The tonnage milled increased by 96,000 tons to 2,296,000 tons and the yield improved from 3.621 to 3.690 dwt. per ton milled, resulting in an additional 25,302 ounces of gold being recovered. Although the average price for gold received by the Company of 249s. 7d. per ounce fine was less by 9d. per ounce than that for the previous year, working revenue nevertheless increased by £305,113 to £5,303,355. Working expenditure at £4,662,511 was, however, £302,557 greater and the working profit for the year at £640,844 was accordingly higher by only £2,556.

To the working profit of £640,844 was added £39,529 in respect of interest received, £29,380 in respect of the Company's share of the surplus of the Outstanding Liabilities Trust Fund as at September 30, 1959, and £7,459 being the difference between sundry other items detailed in the Income and Expenditure Account to give a profit before taxation of £717,212. Taxation provisions absorbed £97,449 leaving £619,763 to be

added to the balance of the Income and Expenditure Account at December 31, 1958, making a total of £1,605,622. Of this amount £348,750 was appropriated for two dividends of 1s. 6d. each per share, and £135,402 was transferred to the Capital Reserve in respect of net expenditure on mining assets and trade investments, leaving a balance in the Income and Expenditure Account at December 31, 1959, of £1,121,470 to be carried forward to the current year. This balance, together with the reserves for Retiring Gratitudes and Abnormal Costs, totalled £1,273,337 which was represented by net current assets as detailed in the Balance Sheet.

The footage developed during the year at 95,468 feet increased by 18,046 feet due to the more plentiful supply of non-European labour available. In order to open up the deeper areas of the mine expeditiously, considerable work was done on main haulages and crosscuts and the footage developed off reef at 43,040 feet was greater by 12,757 feet than in 1958. On the Kimberley Reef, which provided approximately 58 per cent. of the total footage sampled there was an increase in the percentage payability, channel width and value which counterbalanced the decline in these three factors on Main Reef.

The available ore reserve re-estimated at December 31, 1959, decreased by 156,000 tons from 7,331,000 tons at the previous year-end to 7,175,000 tons. There was a substantial decline of 825,000 tons in the reserve available on Main Reef from 3,817,000 tons to 2,992,000 tons due to the continued establishment of longwall stopping faces at depth. On the other hand, the available ore reserve on Kimberley Reef increased by 775,000 tons from 3,223,000 tons in 1958 to 3,998,000 tons. The value of the available reserve was 0.2 dwt. lower at 3.9 dwt. and the estimated stopping width was 0.3 inch greater at 57.5 inches.

The deepening of No. 5A Sub-Vertical Shaft was completed during the year. The equipping of the man-hoist compartments has been completed, and equipping of the rock-hoist compartments is proceeding.

In No. 6A Sub-Vertical Shaft, the cutting supporting and equipping of the spillage winze was completed. Work is continuing on the support of the hoist chamber and headgear portion of the new No. 1E Sub-Vertical Shaft which will be sunk approximately 2,200 feet to the 52nd level in the lower eastern portion of the mine. No. 8 Incline Shaft (Kimberley Reef) was sunk 176 feet to a depth of 3,101 feet below the collar. At April 30, 1960, this shaft had been sunk a further 191 feet. The 12th station has been completed. Satisfactory progress continued to be made in the four service-way winzes connecting with No. 6A Sub-Vertical Shaft. One of these, at 23 West, reached its final depth of 2,165 feet below the collar or 70 feet below the 48th level subsequent to the year-end. Both winzes on Kimberley Reef, namely, 1



West and 17 West 24, are progressing satisfactorily, and had reached depths of 1,064 feet below collar and 436 feet below collar at April 30, 1960, respectively.

A decision has been taken to close down the old Durban Deep Reduction Plant and centralize all reduction operations at the Roodepoort United Plant. This will involve increasing the size of the latter plant to give a capacity equal to that of the two plants. At the same time steps will be taken to improve the efficiency of the Roodepoort United Plant and the combined result should be a substantial saving in the operating costs of the reduction works. It is estimated that the cost of these extensions and modifications will amount to some £530,000 spread over about two years and that such expenditure can be met out of accumulated funds and future profits without encroaching on dividends. It is expected that production throughout the period of the change over will be maintained without disruption. Detailed plans of the new layout are nearing completion and orders for some of the necessary equipment have already been placed.

## CITY DEEP LIMITED

(Incorporated in  
the Union of South Africa)

The Fifty-ninth Ordinary General Meeting of shareholders was held on May 23, 1960. The following is an extract from the circulated Statement by the Chairman, **Mr. P. H. Anderson**, dated April 22, 1960.

The reorganization of the mine about the middle of 1958 embraced a reduction in the milling rate which resulted in the ore milled during 1959 decreasing to 1,353,000 tons from 1,511,000 tons in the previous year. The yield, however, at 4.170 dwt. per ton was higher by 0.198 dwt. but this was not sufficient to prevent a fall in the gold recovery of 17,994 oz. to 282,108 oz. fine. This factor, together with a reduction of 9d. per ounce in the average amount received for gold, resulted in the working revenue of the year at £3,528,946 being lower by £237,050 than in 1958.

Working costs at £3,420,821 were less by £205,986 and in consequence of these changes in revenue and expenditure, the working profit for 1959 was £31,064 lower than that for the previous year.

To the working profit of £108,125 was added a credit adjustment of £41,975 in respect of pneumoconiosis charges, interest received amounting to £31,208 and £6,162 being the difference between the other items of income and expenditure, giving a total profit for the year of £187,470. Taxation and dividends absorbed £13,011 and £126,677 respectively, leaving £60,065 to be added to the unappropriated balance, thereby increasing it to £899,195 at the year-end.

In contrast to the decline in the previous year, the footage developed during 1959 at 41,750 ft. was greater by 15,500 ft. than in 1958. Of this increase, 6,273 ft. were in respect of reef development, mainly on South Reef, while of the balance, 1,035 ft. related to sub-incline shaft sinking, the rate of which was accelerated with a view to improving the ore reserve position. There was a corresponding increase in the footage sampled and although the results on the South and Main Reefs caused the average percentage payability to decline, the value rose from 317 inch dwt. to 335

inch dwt. On Main Reef Leader, the main ore carrier in the mine, payable disclosures fell from 56.9 per cent to 50.2 per cent but in turn the value was higher rising from 339 inch dwt. to 372 inch dwt.

K1 Incline Shaft passed through the Vierfontein dyke and development footage sampled below the dyke on Main Reef Leader in this area totalled 1,670 for the year. From the end of 1958 when development started in the K1 area below the dyke, up to the end of April, 1960, the footage accomplished on Main Reef Leader totalled 2,530 ft. of an average value of 16.9 dwt. over 20 inches, equal to 337 inch-dwt.

Results in the K4 Shaft area, where operations are above the Vierfontein dyke, have also been encouraging and 1,470 ft. were sampled during the year, averaging 10.7 dwt. over a channel width of 22 inches equal to 236 inch dwt.

The ore developed during the year increased by 150,700 tons but the value was lower by 0.8 dwt. per ton. The total ore reserves increased by 97,000 tons at the year-end and for the first time included reserves below the Vierfontein dyke. The value of the available ore reserve, however, declined by 0.3 dwt. owing to the inclusion of certain ore of border-line value in the long wall faces at depth.

I cannot let this occasion pass without referring to City Deep's proud achievement on January 1, 1960, in winning the Industry's "Millionaire Shield" for working a million fatality-free shifts. This is a remarkable record for any mine and particularly so in the case of an ultra-deep mine such as City Deep.

## EAST RAND PROPRIETARY MINES LIMITED

(Incorporated in  
the Union of South Africa)

The Sixty-fourth Ordinary General Meeting of shareholders was held on May 24, 1960. The following is an extract from the circulated Statement by the Chairman, **Mr. P. H. Anderson**, dated May 17, 1960.

The development footage for the year under review totalled 56,403 feet, of which 12,370 feet were sampled. The percentage payability at 39.5 was 3.3 per cent higher, but the average inch-dwt value at 432 was 12 inch-dwt lower compared with the figures for the previous year.

The ore milled during the year amounted to 2,625,000 tons with an average yield of 5.217 dwt per ton, giving a gold recovery of 684,712 ounces fine. The average amount received for this production was £12 9s. 6d. per oz. fine, giving a working revenue of £8,543,064 in respect of gold. A relatively small amount of revenue amounting to £21,625 was received in respect of silver and osmiridium produced, giving a total working revenue of £8,564,689. Working expenditure amounted to £7,168,783, thus giving a working profit for the year of £1,395,906, which was £336,822 lower than the figure for the previous year.

The Company was classified in terms of the Income Tax Act as a deep level gold mine with effect from January 1, 1959. This means that the Company may

add 5 per cent per annum to the unredeemed balance of capital expenditure for the purpose of calculating the amount allowed as a deduction from profits in order to arrive at the taxable income. The 5 per cent "deep level" allowance was estimated to amount to approximately £138,000. After taking this into account, the Company's ratio of profit to recovery was calculated to be 5.4 per cent during the year ended December 31, 1959, and accordingly there was no tax provision in respect of gold mining formula tax. The amount of £9,280 referred to under the heading of "Accounts" was provided to meet taxation on non-mining revenue.

The Far East Sub-Vertical Shaft was completed during February, 1960, at a depth of 9,361 feet below surface.

The new Central reduction plant, the situation of which is shown on the plan that is available on application to the Secretaries, continued to make satisfactory progress during the first four months of 1960, and at April 30, 1960, capital expenditure on the plant amounted to £1,325,560. It is estimated that approximately a further £1,075,000 will be spent on the plant in order to complete it.

The development of the ultra deep areas of the mine made satisfactory progress. Reef development at depth was continued mainly by means of pilot winzes, 1,503 feet on reef having been advanced in 4 winzes during the year. 1,360 feet of this footage were sampled and 670 feet were payable. The payable footage averaged 8.0 dwt over a channel width of 41 inches as compared with an average of 16.2 dwt over a channel width of 33 inches during the previous 9 years.

## CROWN MINES LIMITED

(Incorporated in  
the Union of South Africa)

The Sixty-fourth Ordinary General Meeting of shareholders was held on May 24, 1960. The following is an extract from the circulated Statement by the Chairman, **Mr. P. H. Anderson**, dated May 17, 1960.

Although the total tonnage milled during the year decreased by 125,000 tons to 2,626,000 tons due mainly to the restricted sources of ore, the gold yield improved by 0.141 dwt to 3.197 dwt per ton. This improvement in yield represented an increase of 1s. 8d. in the revenue per ton milled but, as a result of the smaller tonnage, the total revenue declined and the working profit was lower by £25,042 at £173,116.

Compared with the year 1958, the footage developed in 1959 decreased by 1,524 feet to 35,416 feet of which 19,745 feet were sampled. Sampling results during the year disclosed a decrease in payability from 31.1 to 22.0 per cent but values increased from 298 to 313 inch-dwt. The payable ore developed during the year decreased from 530,400 to 321,300 tons and the total ore reserve including shaft and safety pillars was 1,257,000 tons less than that of the previous year, the value and width being approximately the same. During the year the twin reef drives east on 62nd level, below the Vierfontein Dyke, were advanced 2,913 feet with modest results. S.5 Incline Shaft was sunk a further 1,171 feet and at the year-end was 100 feet above the station from which a crosscut will pierce the Vierfontein Dyke and con-

nect up with the twin development ends on 62nd level from R.7 Shaft.

S.3 Incline Shaft was de-watered and re-equipped and, by the end of the year, the deepening of the shaft had commenced.

Stoping operations are confined mainly to the lower western portion of the mine and to Nos. 14 and 16 Shaft pillars, but useful reclamation results continue to be obtained in the upper areas of the mine served by No. 2 and No. 7 Shafts.

R.2 Incline Shaft is being dewatered preparatory to re-equipping and deepening to permit further exploration of the lower areas in the Eastern portion of the mine.

In order to continue without interruption the development of the mine down to a vertical depth of 10,300 feet, application has been made to the Mining Commissioner to prospect in two areas, totalling 603 claims, to the South and South-West of the Company's mining title. Entry into these new areas will be made shortly from S.5 and R.7 Incline Shafts.

In August, 1959, the General Manager, Mr. L. G. C. Wright, took up another appointment within the group, and it is with deep regret that I now report his death on May 4, 1960. I would like to take this opportunity of placing on record the Board's and my sincere appreciation of the valuable services rendered by Mr. Wright during the ten-and-a-half years he was in the employment of this Company, particularly as Assistant General Manager of the mine from April, 1946, to February, 1950, and as General Manager from September, 1955, to August, 1959.

Mr. R. J. Rouillard was appointed Manager on August 16, 1959.

## EX-LANDS NIGERIA

The forty-eighth annual general meeting of The Ex-Lands Nigeria, Ltd., was held on May 20 in London.

Mr. A. Hedley Williams, M.I.M.M., M.Inst.Pet., Chairman, presided and the following is an extract from his circulated Statement:—

The output for 1959 was 467 tons of Tin, of which we were permitted to ship 408.8 tons compared with 474 tons produced and 361.3 tons shipped in 1958.

Overall average operating costs were again kept to a very satisfactory low figure, viz. £226 5s. 8d. per ton.

The market price of Tin was maintained at a level satisfactory to producers and consumers alike. We averaged £788 3s. 5d. per ton metal against £735 1s. 5d. for the previous year.

For the first and second quarters of 1960, the quotas have again been increased. For the first quarter, we were permitted to ship 154,406 tons and the current quarter 157.9 tons.

At December 31, 1959, we were holding 192,876 tons Tin stocks which stood in our Books at £43,644 7s. 9d. In addition, we have with the Buffer Stock tin to the value of £46,887.

The year's operations yielded a working profit of £59,030. £26,000 is set aside for tax, £5,000 has been deducted to cover prospecting expenditure, and the Directors recommend a dividend of 20% less tax.

Later this year, Nigeria is to be accorded full independence but will remain within the framework of the Commonwealth. We are happy in the belief that political stability and unity will be assured.

The report and accounts were adopted.

## SOUTH CROFTY

The fifty-fourth annual general meeting of South Crofty, Ltd., was held on May 20 in London.

Mr. J. E. Denyer, A.R.S.M., M.I.M.M., Chairman, presided, and the following is an extract from his circulated Statement:—

During 1959, 92,530 tons of ore were treated as against 75,596 tons in 1958. Black tin produced totalled 892 tons compared with 742 tons. Under the control of the Buffer Stock Manager the price of tin metal remained steady during the year and the average price realized by the Company was £784 per ton compared with £717 in 1958. Main and subsidiary development totalled 11,072 feet as against 10,481 feet and the results were satisfactory; improvements were made in the ventilation of the mine.

The installation of a sinking hoist and grab in New Cook's Kitchen Shaft were completed and by December 31, 1959, the shaft had been deepened by 53 feet, a station cut on the 360 fathom level and considerable progress made on ore and waste passes.

It was gratifying to report a profit for the year of £29,463 which compares with a loss of £51,575 for 1958. The improvement of £81,038 is the result of an increase of £108,025 in sales, principally of tin, less a net increase in costs of £26,987. Of the increase in the sales of tin, which amounted to £105,793, approximately one quarter arose from the higher price of tin ruling during 1959. The rest of the increase is due to greater production.

The report and accounts were adopted.

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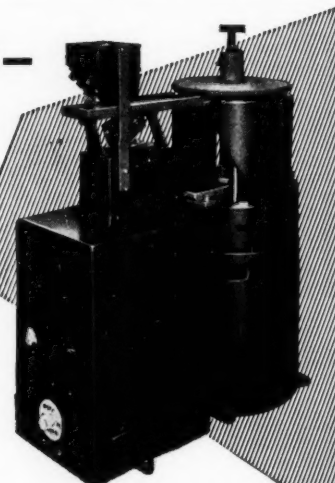
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## BRACKEN MINES LIMITED

The Chairman, **Mr. T. P. Stratten**, welcomed members to the First Annual General Meeting of the Company, held at Johannesburg, on May 20, 1960, and said that, as some members might not be familiar with the Prospectus issued by the Company in October, 1959, he would briefly recapitulate some of the information contained in that document.

### Lease Area

He said that the area over which the Company would acquire the mining lease which the Government of the Union of South Africa had agreed to grant, measured 2,932 morgen, equivalent to 4,222 claims. The lease area extended westwards from the boundary of Winkelhaak Mines, Limited, and adjoined Leslie Gold Mines, Limited, to the north-west. In the lease area the reef in general appeared to sub-outcrop about 700 feet below surface under the Karroo System, more or less along the line of the southern boundary of the lease area, and to dip northwards at about 30°. There were indications of extensive major faulting resulting in appreciable loss of reef-bearing ground, and also of severe minor faulting. The maximum depth of the reef in the lease area appeared to be about 3,200 feet below surface.

### Programme

It was intended to develop the mine from two circular shafts situated adjacent to one another, more or less in the middle of the lease area, which would be sunk to a depth of about 2,700 feet. The No. 1 Shaft was a 17-foot diameter shaft designed to handle men and materials. The No. 1A Shaft was a 14 foot diameter shaft to handle rock. The cementation boreholes drilled on the shaft sites had shown that the depth of the reef in No. 1A Shaft was 2,329 feet, and in No. 1 Shaft, 2,362 feet below surface. The capacity of these shafts would be sufficient for a mill tonnage of 90,000/100,000 tons per month, though later, to assist ventilation, small vertical winzes would be sunk along the sub-outcrop. It was intended in due course to erect a reduction plant with an initial nominal capacity of 75,000 tons per month, which might later be extended.

### Progress

Work on site started towards the end of October. At No. 1A Shaft, the erection of the headgear and hoists had been completed in March—full scale sinking commenced early in April. This Shaft had reached a depth of 689 feet. No. 1 Shaft had been sunk to a depth of 111 feet below surface using temporary equipment and sinking had then been suspended for the erection of the headgear and permanent hoist. This work was approaching completion and full scale sinking of this shaft was expected to start in July or August of this year.

Very good progress had been made with the mine buildings and plant and with housing for European and Native employees. The initial stores buildings and offices, the workshops and change-houses were complete and in use. The shaft office was expected to be ready for

occupation within the course of the next two or three weeks. The first portion of the Native Compound had been occupied in March of this year and was at present being used to house the Native employees both of the Company and of Leslie Gold Mines. These latter employees would move to their own compound at Leslie Gold Mines when that building was established later in the year.

A temporary water supply had been provided to the Mine by a pipeline from Winkelhaak Mines, Limited. In due course a permanent water supply would become available from the Rand Water Board.

Most of the housing for European employees was being provided by the Evander Township Company in Evander Township but certain key personnel, who, for reasons of safety and efficiency, must live nearer the scene of operations would be housed in a mine village which was being developed on a site on the Leslie Gold Mines property conveniently situated to serve both Bracken and Leslie mines. Construction of the houses and extensions to the Single Quarters in Evander Township to meet the initial requirements of the mine was keeping well up to schedule.

### Timetable

The Chairman said that the Consulting Engineers, in their report dated September 28, 1959 which accompanied the Prospectus, indicated that, provided no unforeseen difficulties arose, development should have disclosed sufficient payable ore to enable trial milling to commence three to three and a half years after work in the lease area started, and for production proper to commence about six months later. While full scale shaft sinking had only just started and there were, therefore, many uncertainties

## LESLIE GOLD MINES LIMITED

The Chairman, **Mr. T. P. Stratten**, welcomed members to the First Annual General Meeting of the Company, held at Johannesburg, on May 20, 1960, and said that, as some members might not be familiar with the Prospectus which had been issued by the Company in October, 1959, he would briefly recapitulate some of the information contained in that document.

### Lease Area

He said that the area over which the Company would acquire the mining lease which the Government of the Union of South Africa had agreed to grant, measured 2,934 morgen, equivalent to 4,225 claims. The lease area lay immediately to the north of the western portion of the property of Bracken Mines, Limited. In the lease area the reef in general appeared to sub-outcrop about 700 feet below surface under the Karroo System, more or less along the line of the southern boundary, and to dip northwards at between 25° and 30°. There were indications of fairly severe faulting throughout the lease area. The maximum depth of the reef in the lease

still to be faced, nevertheless, in view of the good progress made to date, it did seem possible that these former estimates of the time to take the mine to production might be bettered.

### Finance

Up to the end of April, expenditure on property, shafts, plant, equipment, and other items, including expenditure in connection with Evander Township Company, amounted to £1,406,628, leaving a balance of £5,593,372 of the £7,000,000 provided in share capital. It was estimated that these funds would be sufficient to enable the Company to finance its operations up to about the middle of 1962, but thereafter, as indicated in the Prospectus, additional funds would be required to complete the programme of taking the mine to production. How this further finance should best be provided and when it should be raised were matters which still had to be decided.

### State of Emergency

Towards the end of March, disturbances had occurred in Native townships in the Vereeniging and Cape Town areas and elsewhere and a state of emergency, had been proclaimed, covering all the important urban centres. Following this and other measures, tension had relaxed somewhat and all appeared to be quiet, though the proclamation remained in force in some areas.

The troubles concerned almost exclusively urban workers, and employees at the mines were not involved.

The Report and Accounts were adopted. The retiring Directors, Messrs. T. P. Stratten, C. B. Anderson, P. H. Anderson, I. T. Greig, H. C. Koch, E. M. T. Matthews and M. W. Richards, were re-elected.

area appeared to be about 4,500 feet below surface.

### Programme

It was intended to develop the mine initially from two circular shafts, situated adjacent to one another in the southern half of the lease area. No. 1 Shaft was a 23 foot diameter shaft to handle rock, men and materials with hoists large enough to supply 100,000 mill tons per month. It would be sunk to a depth of about 3,100 feet. No. 1A Shaft was a 14 foot diameter shaft providing up-cast ventilation initially and the statutory second outlet. At a later stage up-cast ventilation winzes would be established along the sub-outcrop. It had now been decided that instead of continuing the No. 1A Shaft down to 3,100 feet below surface, as formerly planned, it would be sunk initially to a depth of only 2,050 feet thus enabling an earlier start to be made with reef development on the upper levels. The actual reef depth in the area of the shafts was just under 1,500 feet. In the course of cementing the site, several further intersections of reef had been



obtained and these, on average, confirmed the results already published. It was intended in due course to erect a Reduction Plant with an initial nominal capacity of 75,000 tons per month. The capacity of the Reduction Plant would be extended to 100,000 tons per month as soon after the start of production as results from underground development warranted this step. Later the capacity would be further increased to an ultimate milling rate of about 150,000 tons per month.

### Progress

Work on the site had started towards the end of October. At No. 1A Shaft, the erection of the headgear and hoists had been completed in March and full scale sinking commenced in April. This shaft had reached a depth of 508 feet. No. 1 Shaft had been sunk to a depth of 110 feet below surface using temporary equipment and sinking had then been suspended for the erection of the headgear and permanent hoist. This work was well advanced and full scale sinking of this shaft was expected to start in July or August of this year.

Very good progress had been made with the mine buildings and plant and with housing for European employees. The initial stores buildings and offices, the workshops and changehouses were complete and in use. The shaft office was expected to be ready for occupation within the course of the next few weeks.

A temporary water supply had been provided to the mine by a pipeline from Winkelhaak Mines, Limited. In due course a permanent water supply would become available from the Rand Water Board.

Most of the housing for European employees was being provided by the Evander Township Company in Evander Township but certain key personnel, who, for reasons of safety and efficiency, must live nearer the scene of operations, would be housed in a mine village which was being developed on a site on the Company's property conveniently situated to serve the mine and also Bracken Mines. Construction of the houses and extensions to the Single Quarters in Evander Township to meet the initial requirements of the mine was keeping well up to schedule.

At present, all Native labour was being housed in the compound at Bracken Mines, Limited. The compound on the Company's property would be established later in the year.

### Timetable

The Chairman said that the Consulting Engineers, in their report dated September 28, 1959, which accompanied the Prospectus, indicated that, provided no unforeseen difficulties arose, development should have disclosed sufficient payable ore to enable trial milling to commence three and a half to four years after work in the lease area started, and for production proper to commence about six months later. He said that, while full scale shaft sinking had only just started and there were, therefore, many uncertainties still to be faced, nevertheless, in view of the good progress made to date and the fact that the No. 1A Shaft would be stopped at about 2,050 feet below surface, it did seem possible that these former estimates of

the time to take the mine to production might be bettered by about six months.

### Finance

The Chairman said that, up to the end of April, expenditure on property, shafts, plant, equipment and other items, including expenditure in connection with Evander Township Company, amounted to £1,473,286, leaving a balance of £6,526,714 of the £8,000,000 provided in share capital. It was estimated that these funds would be sufficient to enable the Company to finance its operations up to the middle of 1962, or perhaps a little longer. Thereafter, further finance, perhaps slightly less than envisaged in the Prospectus, due to the shallower depth of No. 1A Shaft, would be required to take the mine to the point at which further capital expenditure could be financed out of profits. How this should best be provided and when it should

be raised were matters which still had to be decided.

### State of Emergency

Towards the end of March, disturbances had occurred in Native Townships in the Vereeniging and Cape Town areas and elsewhere and a state of emergency had been proclaimed, covering all the important urban centres. Following this and other measures, tension had relaxed somewhat and all appeared to be quiet, though the proclamation remained in force in some areas.

The troubles concerned almost exclusively urban workers, and employees at the mines were not involved.

The Report and Accounts were adopted. The retiring Directors, Messrs. T. P. Stratten, C. B. Anderson, A. H. Ball, I. T. Greig, H. C. Koch, T. Reekie, M. W. Richards and L. C. Watson, were re-elected.

## WINKELHAAK MINES LIMITED

**Mr. T. P. Stratten**, the Chairman of the Company, in addressing members at the Annual General Meeting held at Johannesburg on May 20, 1960, said that after some trial milling, production commenced in December, 1958, so that 1959 was the first full year of operations and 908,000 tons were milled for a yield of 5.18 dwt. per ton. The working revenue amounted to £2,945,872 and working costs absorbed £2,358,242. The working profit for the year was thus £587,630. After taking into account other items of income and expenditure, the balance available for appropriation was £616,903. Of these other items the principal ones were £83,695 for payment of interest on loans and the surplus of £104,166 on the sale to Bracken Mines, Limited and Leslie Gold Mines, Limited of two-thirds of the Company's interest in its former wholly-owned subsidiary, Evander Township, Limited.

An amount of £335,000 was transferred to the reserve for expenditure on fixed assets, £41,000 was set aside as a provision for European leave pay and preliminary expenses amounting to £32,350 had been written off, leaving an unappropriated profit of £208,553.

### Mining Lease

The Government of the Union of South Africa had, since the end of 1959, agreed to grant the Company an extension to the lease area on its south-western boundary. The additional area covered approximately 170 morgen, equivalent to 245 claims so that the total area included in the Company's mining lease would amount to 5,363 claims. The lease formula governing the share of profits to be paid to the Government remained unchanged.

### Development and Ore Reserve

The total development footage accomplished during 1959 both in the lease area and in the extension was 58,099 feet, being some 4,500 feet more than in 1958. Of this footage 23,995 feet was on reef and sampled disclosing 19,040 feet or 79 per cent to be payable averag-

ing 517 inch-dwt. The recalculated ore reserve within the original lease area amounted to 1,600,000 tons having an average value of 6.8 dwt. per ton over an estimated stoping width of 60 inches. Compared with the previous year there was an increase of 400,000 tons, the value showed an improvement of 1.1 dwt. per ton and the estimated stoping width was 2 inches more. In addition, 200,000 tons of approximately the same value and width had been disclosed in the extension to the lease area.

### Expansion of Operations

The Chairman said that the extensions to the Reduction Works to increase the nominal capacity of the plant to 90,000 tons per month were approaching completion. These extensions consisted of the installation of a fifth 12-foot diameter tube mill, and the addition of a further thickener tank, four Brown agitator tanks, one filter and a reverberatory furnace.

The Consulting Engineers had now recommended that, in order to develop the deeper levels of the mine and to make possible in due course expansion of the scale of operations to an ultimate milling rate of the order of 150,000 tons per month, a 23-foot diameter shaft should be sunk to a depth of approximately 4,300 feet to serve the eastern and central portions of the lease area. The shaft, which would be known as No. 2 Shaft, had been sited on the position of Borehole W.S. 32, approximately 6,000 feet north-east of No. 3 Shaft. The preparatory work, including cementation from a surface borehole, had already begun and full-scale sinking was planned to start early in 1961.

### Finance

The loan of £1,000,000 granted by the National Finance Corporation of South Africa, repayable in 1963, and the temporary loan facilities granted by Union Corporation, Limited continued in force. Early this year the maximum of these latter loan facilities was reduced from £750,000 to £350,000 as such large



facilities were no longer required and the whole of this loan had been repaid. The cost of the No. 2 Shaft was expected to be something under £2,500,000 spread over three and a half years or so to which had to be added in due course the cost of expanding the Reduction Plant to a nominal capacity of 150,000 tons per month and providing the necessary expansion of services.

There would also be some further expenditure in connection with housing, but this should be covered by further housing loans. The Directors had given careful consideration as to how best to finance the main programme and were of opinion that the most appropriate method and the one in the best interests of members would be to finance it out of profits, assisted where necessary by temporary borrowing in terms of the facilities which Union Corporation had signified its willingness to make available if needed. It was believed that the working profits from the mine would be sufficient to finance this expenditure and still leave enough to enable an early start to be made with dividend declarations.

#### Bracken Mines, Limited and Leslie Gold Mines, Limited

These two new companies commenced work in the Kinross area towards the end of 1959 and members of the Company were offered the opportunity in December last of providing a modest part of the capital funds required by them.

The development of two new gold mines in the Kinross field had brought in

its train certain financial benefits to the Company through the sharing among three mines of the costs of services and facilities such as power and water, the Native hospital and Evander Township, all of which until recently Winkelhaak Mines, as the pioneer mine in the area, had had to finance entirely by itself.

#### State of Emergency

Towards the end of March disturbances had occurred in Native townships in the Vereeniging and Cape Town areas and elsewhere and a state of emergency had been proclaimed covering all the important urban centres. Following this and other measures tension had relaxed somewhat and all appeared to be quiet, though the proclamation remained in force in some areas.

The troubles concerned almost exclusively urban workers, and employees at the mines were not involved.

#### Operations in 1960

During the first four months of the current year the tonnage milled totalled 325,000 tons giving an average yield of 6.16 dwt. per ton and a total working profit of £436,629. The development footage totalled 18,778 feet of which 8,295 feet was on reef and sampled, disclosing 7,250 feet or 87 per cent payable averaging 556 inch-dwt.

The Report and Accounts were adopted. The retiring Directors, Dr. M. S. Louw and Messrs. E. Jacobson, H. C. Koch and E. J. Read, were re-elected.

## ST. HELENA GOLD MINES LIMITED

**Mr. C. B. Anderson**, the Chairman of the Company, in addressing members at the Annual General Meeting held at Johannesburg on May 20, 1960, said that in 1959 a plentiful supply of Native labour enabled the mine to increase the tonnage milled to the new record figure of 1,810,000 tons. The yield improved by 0.32 dwt. to 6.17 dwt. per ton and there was an increase of approximately 1d. per ounce fine in the average price received for gold. As a result of these favourable factors the working revenue at £6,985,075 was £1,600,814 higher than in 1958. Working costs absorbed £3,854,793 so that the working profit was £3,130,282, being an increase of £819,630.

After taking into account sundry revenue and expenditure the net profit for the year was £3,089,625. Capital expenditure was £1,282,834, £195,001 was transferred to Loan Redemption Reserve, and two dividends, totalling 3s. per share, or 11d. per share more than in 1958, were declared and absorbed £1,443,750. The balance carried forward was £992,262.

#### Development and Ore Reserve

The total development footage driven during the year within the lease area at 78,587 feet was 5,127 feet more than in 1958. Of the 21,770 feet on Basal Reef and sampled, 58 per cent proved payable, averaging 769 inch-dwt. As com-

pared with the previous year this represented an increase of 9 per cent in the percentage payability and of 250 inch-dwt. in the average inch-dwt. figure, due mainly to the higher values encountered in the No. 2 Shaft area. In addition, 3,069 feet was driven in the Theronia Prospect area, 1,190 feet was sampled and 405 feet, or 34 per cent, proved payable, averaging 244 inch-dwt.

The Chairman said that the severe faulting in the No. 2 Shaft area had led to a low percentage of on-reef development there. This had slowed down the expected build-up in ore reserves and restricted the stoping rate in the area. Values disclosed, however, had been very satisfactory.

Two drives northwards from No. 2 Shaft had traversed a high-grade zone causing a marked increase in values for the quarter ended June 30, 1959. These and other northward drives from No. 2 Shaft on the 15 to 19 Levels were now all fairly close to the Western Holdings' boundary. Development below 19 Level from No. 2 Shaft had commenced a few months previously, and a limited amount of on-reef development had been done on 20, 21, 22 and 23 Levels.

At December 31 last the ore reserve was estimated to amount to 4,000,000 tons being an increase of 600,000 tons over the comparable figure at the end of 1958. The average value rose by 1.0 dwt. to 7.5 dwt. per ton while the estimated stoping width was unchanged at 55 inches. Of this ore reserve tonnage

about one quarter was below 12 Level, in the No. 2 Shaft area, and had an average of 11.2 dwt. The balance of the ore reserve tonnage above 12 Level had a value of 6.1 dwt.

#### President Brand Boundary Area

Mr. Anderson went on to say that very good progress had been made with the sinking of No. 7 Shaft. On February 6 of this year at 4,013 feet the shaft had holed into a station which had been cut from the 18 Level cross-cut from No. 2 Shaft. It had been decided to continue the sinking of No. 7 Shaft to its final depth at 24 Level of approximately 5,500 feet. This deepening would assist the ventilation of the lower levels of the mine served from No. 2 Shaft. At the end of the previous week the shaft had reached a depth of 4,884 feet below surface, 18 Level cross-cut, which had passed beyond the position of No. 7 Shaft, was being developed to the up-thrown block of reef on the President Brand boundary and was through the major fault responsible for the up-thrown block. Because it would first be necessary to establish a fairly extensive haulage layout in the area, it was difficult to foretell when any significant amount of on-reef development footage would be accomplished. Moreover, the effect of the lesser faulting which was known to exist was uncertain.

#### Future Outlook

Capital expenditure in 1960 would again be heavy and was expected to amount to about £750,000. With the present capital programme reaching completion, expenditure could be expected to be reduced in 1961. At some time in the future, however, further shafts would be necessary fully to exploit the remainder of the lease area. The timing of these shafts and consequently the expenditure involved were undecided.

It was anticipated that the Company's loss for taxation purposes would have been extinguished by the end of 1960 so that the Company would then become liable for tax and shortly thereafter for lease payments.

#### Results in 1960

During the first quarter of 1960 the ore milled totalled 460,000 tons and the working profit was £930,405. Capital expenditure amounted to £197,122.

In the first four months of the year the development footage totalled 27,004 feet of which 5,560 feet was on Basal Reef and sampled, disclosing 2,820 feet, or 51 per cent, payable averaging 768 inch-dwt.

A dividend of 2s. 3d. per share was declared in March of this year, being 1s. per share more than the corresponding dividend last year.

#### State of Emergency

Towards the end of March disturbances had occurred in Native townships in the Vereeniging and Cape Town areas and elsewhere and a state of emergency had been proclaimed, covering all the important urban centres. Fol-

lowing this and other measures, tension had relaxed somewhat and all appeared to be quiet though the proclamation was still in force in some areas. The troubles concerned almost exclusively urban workers, and employees at the mines were not involved.

In response to questions by members the Chairman gave the following replies—

There has been no surface prospecting drilling during the last eighteen months except for a hole south of the southern-most workings which is still in progress. The Basal Reef was not intersected in the crosscut from No. 2 Shaft to No. 7 Shaft or in No. 7 Shaft, both of which were in

the hanging wall. At the end of April, 18 Level A Haulage East from No. 7 Shaft, which was in footwall and had not intersected the Basal Reef, was 1,735 feet from the President Brand boundary and 1,760 feet from No. 7 Shaft. There was no intention at the moment to raise the milling capacity to 200,000 tons per month. The practice of some companies of issuing a Chairman's Statement with the Annual Report had not been followed as it was felt that more up to date information could be given in an address at the Annual Meeting. However, the matter would be considered by the Board. Very little reef had been exposed on the lower levels in No. 2 Shaft and this had given varying values

a bit lower than in the higher levels. The major fault parallel to the President Brand boundary was expected to result in a loss of ground to the Company but the extent was not known. It was not proposed to issue to members a larger scale underground plan showing block ore reserve values as, apart from the difficulties in deciding upon the size of the blocks, the map might not be helpful due to inaccuracies in evaluating small areas and the fact that mining policy was governed by the average of the total ore reserve.

The Report and Accounts were adopted. The retiring Directors, Messrs. J. M. M. Ewing, E. M. T. Matthews and T. P. Stratten, were re-elected.

## Technical Briefs

### Instrumentation in Mineral Dressing

Instrumentation is being used to an increasing extent in mineral dressing. In the Leveck mill of International Nickel Co. of Canada (see issue of April 22, 1960), which has just been put in operation extensive use has been made of such controls and automation is used to assist the crushing, whilst in the grinding circuit apart from weightometers automatically controlling the rate of feed, automatic density control is carried out by the gamma ray type of density measurement. In flotation pulp density, temperature and alkalinity are also controlled automatically as well as the final concentrate thickeners and filters.

Another indication of what can be done by automatic blending and recording the weight of material in bins can be seen at the automatic coating plant Caldon Low Quarry of Derbyshire Stone Ltd., in Staffordshire, where electric load cells are used for weighing and grading the limestone aggregate.

#### FLOTATION CHARACTERISTICS OF GOETHITE

Owing to the fairly rapid depletion of high grade iron ores there has been increased interest shown in the study of flotation for the treatment of low grade ores and both anionic and cationic collection of the iron oxides as well as the removal of silica usually by cationic collection has been investigated.

In view of the fact that the effectiveness of any one method depends largely on the mineralogical composition, and since there was a paucity of information about the flotation of goethite or limonite compared with that available in respect of hematite and magnetite, an investigation has been undertaken by the U.S. Bureau of Mines to collect fundamental data and general information on the floatability of goethite. In this work, flotation tests have been correlated with contact angle measurements and the electrokinetic properties of this mineral.

It has been found that the isoelectric point of goethite occurs at pH value of 6.7, the surface being positively charged at pH value below 6.7 and negatively charged at high pH values.

Anionic collectors are effective as might be expected on the positively charged goethite and cationic ones more effective on the negatively charged goethite. The same is true for the flotation of quartz but the isoelectric point is nearer a pH value of 2.

As a result, the best flotation of goethite with such collectors as sodium dodecyl sulphate and sodium dodecyl sulphonate occurs at a low pH but optimum with dedecyl ammonium chloride occurs at a pH of 8.8 to 12.0.

It has also been found that the optimum separation of goethite from quartz occurs at a pH of 1 to 3.5 when using sodium dodecyl sulphate and that the optimum flotation of quartz from a mixture of quartz and goethite using dodecyl ammonium chloride at a pH value between 5.5 and 7.5. Furthermore, although the addition of a very small amount of goethite slime (0.5 per cent) completely inhibits flotation of quartz, a relatively large quantity of goethite slime (i.e. 5 per cent) appears to have little effect on the flotation of goethite. This last observation does not conform with industrial practice where desliming is usually considered an essential step for efficient separation with petroleum sulphonates although recent papers from workers in Scandinavia and Russia indicate that desliming does not appear to be essential in some cases.

The Proprietors of British Patent No. 772,467 for "ROTARY CYLINDRICAL VALVE FOR THE CONTROL OF AIR-JIGS FOR THE DRESSING AND CLEANING OF COAL AND ORE", desire to enter into negotiations with a firm or firms for the sale of the patent or for the grant of licences thereunder. Further particulars may be obtained from Marks and Clerk, 57 & 58 Lincoln's Inn Fields, London, W.C.2.

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Brettenham House, Lancaster Place,  
Strand, London, W.C.2.

## BALFOUR GROUP RESEARCH CENTRE

On May 27 the Secretary of State for Scotland, the Rt. Hon. John S. MacLay, C.M.G., M.P., opened the Balfour Group research and development centre.

The building houses a series of modern and well-equipped laboratories designed and made by the Group for the carrying out of research and development work in the design and operation of chemical process plant—with a wide range of industrial applications—and techniques of use and manufacture of materials of construction. Integrated with the laboratories are comprehensive installations of pilot plant, encompassing the main types of processes and equipment, to demonstrate applications on clients' raw materials. Complete processing systems can be analysed, tested and evaluated in terms of size, output, operation, number of stages involved, operating temperatures, flow arrangements and so on, so that the most efficient conditions for the production of a successful end product will be ensured before expense is incurred on installing full-scale plant.

The plant layout has been largely designed on a Meccano principle and the strategic deployment of equipment gives the utmost flexibility to every operation.

Pilot plant is available for the study of drying, mass transfer, heat flow, reaction and kinetics, evaporation, distillation, fractionation, size reduction, mixing, emulsifying and so on. A sludge pump for dealing with slurries and semi-solids can be studied under actual operating conditions. An interesting installation in the centre is the new Scott-Wemco torque-flow pump.

A function of the Centre is the provision of training facilities in every sphere of chemical engineering. In conjunction with local technical colleges, a student and graduate apprenticeship scheme exists by which suitable young men and women can reach full professional status in the best possible conditions while receiving industrial training. In certain cases, training facilities may be accorded to clients' personnel.

The Balfour Group is composed of Henry Balfour & Co. Ltd., George Scott & Son (London) Ltd., Ernest Scott & Co. Ltd., and the associated company, Enamelled Metal Products Corporation (1933) Ltd.

## STEEL RESUMES ITS UPWARD MARCH

Pig iron production this year should reach a record level of about 16,000,000 l. tons, states the annual report of the British Iron and Steel Federation for 1959. Crude steel production should reach and may pass 24,000,000 tons, a record figure some 20 per cent higher than last year. The level of almost all finished products should increase considerably, with an especially substantial increase in steel sheet. If consumers build up stocks on anything like the scale of the 1955-57 period, the industry may find itself hard put to meet all the demands made upon it.

Despite the impact of the recession, capital expenditure in each of the years 1958 and 1959 was running at a rate of about £100,000,000. This year the industry expects to spend nearly a quarter more. It is at present engaged in estimating the likely demand for its products in the sixties.

In a foreword to the report Mr. Richard Summers, president of the Federation, emphasises that the sixties will bring a much more competitive steel market. As technical progress speeds up, steel will face a widening range of substitute materials, such as concrete, plastics and aluminium, but the British steel industry is confident that it can expand its markets in the face of this challenge.

The recession and its aftermath had a pronounced effect on imports of iron ore, particularly at the beginning of 1959. Not only did iron production run at a low level, but with ore much more easily available and companies under some financial pressure, stocks of imported ore were reduced. This in turn reflected on the import programme and arrivals in the first five months of the year averaged only 846,000 tons a month compared with 1,131,000 tons in the corresponding period of 1958.

Trading conditions also caused a marked change in the relative use of home ironstone and foreign iron ore. The proportion of home ironstone used in the recession increased, partly because the makers of heavy steel products were badly affected by the low level of demand, and partly because the low iron content of home ironstone enabled some furnaces to be kept in blast which would otherwise have been closed down, thus allowing gas balances to be maintained.

By the fourth quarter the trend was reversed. Consumption of imported ore rose from 17.3 cwt. a ton of pig iron produced in March, to 18.9 cwt. in December. Arrivals of imported iron ore in the second half of the year averaged 1,250,000 tons a month.

Consumption of home ironstone per ton of pig iron produced decreased from 25.6 cwt. in March to 22.6 cwt. in December. Production of home ironstone in the year was 14,870,000 tons compared with 14,610,000 tons in 1958, a 53-week year.

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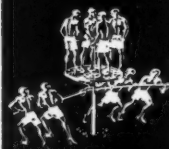
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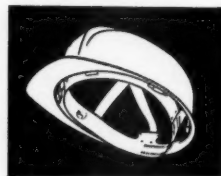
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*Right: CABLE BELT rope driven conveyor. Length 7,260 feet, Lift 300 feet, 24 in. Belt at 200 feet/minute, handling 200 tons/hour of chalk.*

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